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Tough-Hard, Shock Resistant Gearing

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Precautions observed and technique followed are given for selection of steel and heat-treatment

Completely upset grain flow and fiber are clearly shown by the macrograph of the surface of half an upset hammer-forged pinion blank deeply etched in hot hydrochloric acid

THE SATISFACTORY performance of a gear drive is primarily dependent upon the quality of its gear equipment, which is determined by the kind of steel used, by the heat-treatment to which the gears have been subjected and by accurate machining. The gears are designed with such dimensions and with such tooth form as to withstand the wear and tear of the particular type of service and also to resist the applied loads, stresses, and shocks. To meet these conditions a steel must be selected of such quality and chemical composition that, when subjected to a definite heat-treatment, it will impart minimum physical properties to the gear teeth.

Heat-treated gears may be classified into two divisions: first, case hardened gearing; and second, fully quenched and tempered gearing. In the first class fall the carburized low-carbon plain and alloy steels. These are selected for maximum wear resistance to abrasion, for low and medium tooth loads and for moderate stresses. In the second class are the fully quenched medium-carbon plain and alloy steels, which are selected not only for excellent resistance to rolling and sliding wear but also for resistance to heavy loads, high stresses, shock and impacts.

Railway, mine locomotive and steel mill gearing are subjected to high tooth loads with frequent sudden overloads and impacts. To meet such drastic services a type of gearing has been developed which is characterized by its tough-hard, shock resisting properties. This type of gearing has a tough-hard tooth bearing surface to resist sliding and rolling wear, and a strong and tough tooth core and tooth root to resist excessive loads, sudden shocks and high impacts. The combination of the above properties in the gearing produces a tooth of high endurance limit, which enables the employment of high working stresses and stress concentration without failure by fatigue.

Since tooth of a gear or pinion is loaded as a cantilever beam, the grain structure or "fiber" in the raw material should be partially radial, and not unidirectional, to insure that the working stress at the root of each tooth fall transversely across the fiber flow of the structure and not parallel to it. This is accomplished by thoroughly working the steel banks by the upset hammer forging process. This process further makes the steel more dense and, therefore, more responsive to good heat-treatment.

To impart to this upset-forged steel the tough-hard, shock resisting properties, it is given a thorough normalizing

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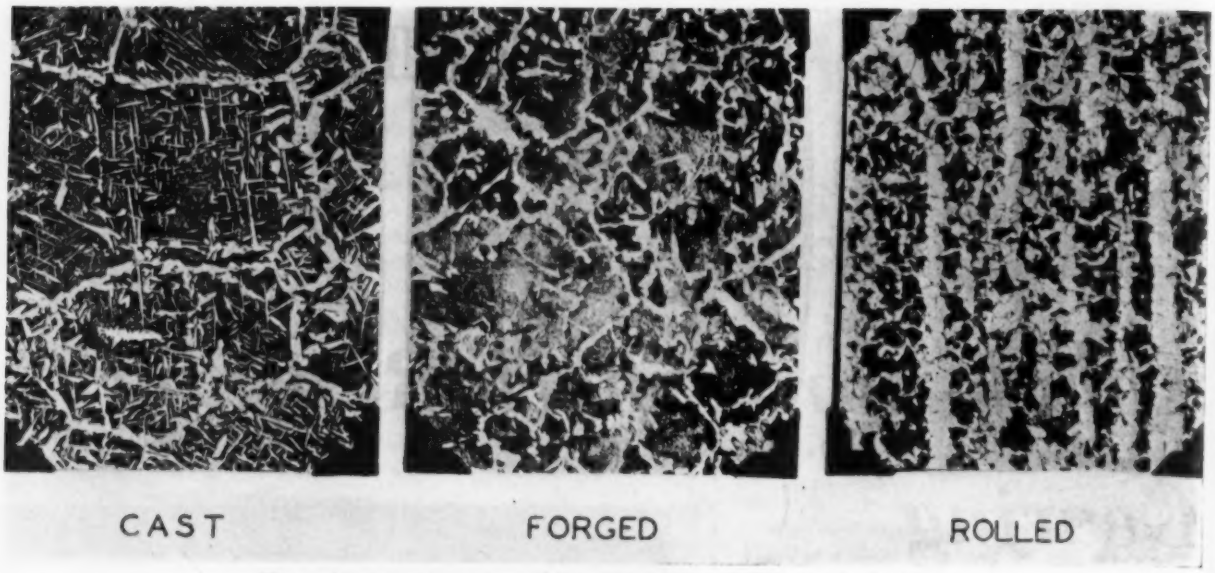
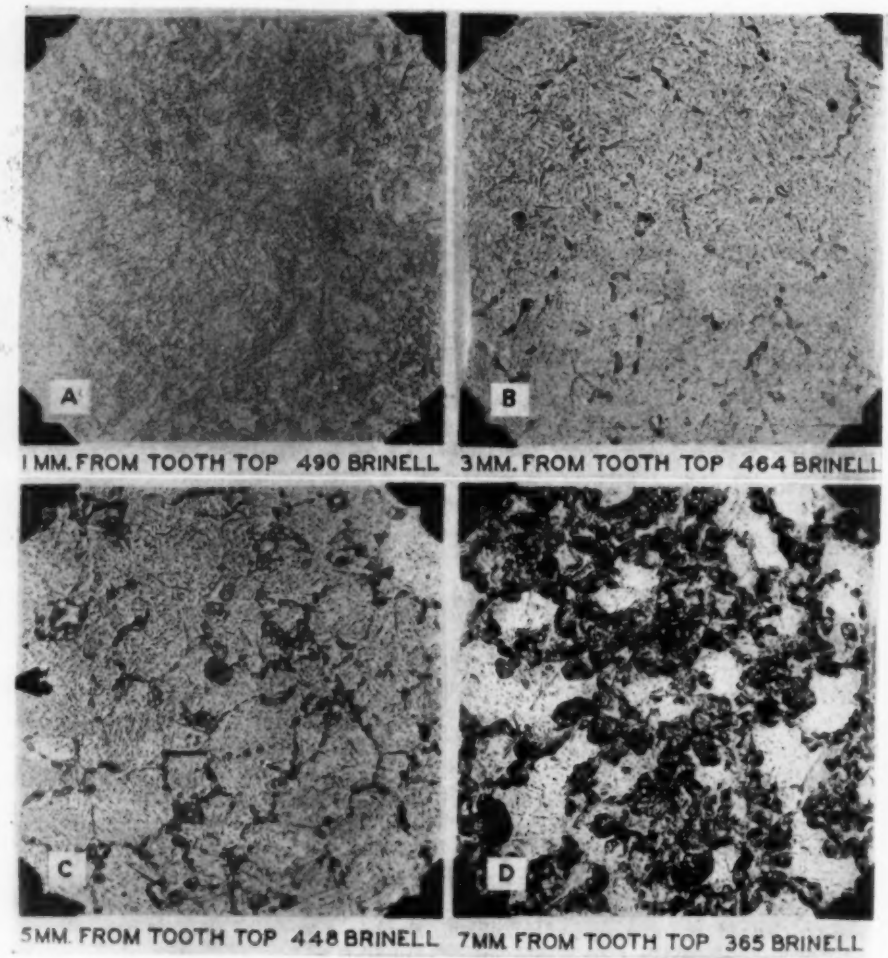


The micro-structures are shown of a steel casting, a hot-rolled bar and an upset hammer forging all of 0.40-0.50 carbon steel

heat-treatment, prior to machining, by soaking at a temperature above the critical range and cooling at such a rate to produce a definite grain size. This treatment is important as it removes the ill effects of the high forging heat, it refines the grain, it homogenizes the structure, and it conditions the steel for controlled and uniform hardening. Cast gear blanks are thoroughly annealed for grain uniformity and homogenization. Fine grain steels are tougher, have higher impact values and less distortion in heat-treatment than coarse grain steels. Coarse grain carbon steels are deep hardening, while fine grain steels are relatively shallow hardening. Therefore, by controlling the size of the grain in the normalizing heat-treatment, any desired depth-hardening can be obtained, depending upon the size of the teeth.

To insure the highest type and super quality of medium carbon steel, the material should be purchased on a close and limited specification. A close manganese range is specified to give sufficient manganese for maximum hardenability and yet not too high to produce possible internal ruptures during quenching. Low values for sulphur and phosphorus are demanded to insure clean steel, free from inclusions and non-metallic impurities. A minimum silicon is insisted upon to insure completely deoxidized and properly "killed" steel, and also its freedom from undesirable "abnormality." In addition, a close range of the sum of the carbon plus manganese is specified to guarantee the proper ratio of these two vital elements in the steel. Furthermore, the material specification sheet states that the steel must be free from ingotism, dendrites, ferrite banding and segregation.


A
B
1 MM. FROM TOOTH TOP 490 BRINELL
3 MM. FROM TOOTH TOP 464 BRINELL
C
D
5 MM. FROM TOOTH TOP 448 BRINELL
7 MM. FROM TOOTH TOP 365 BRINELL

Micro-structures of different spots on the polished and etched transverse face of a specially heat-treated railway pinion. *A* shows the hard, wear resistant martensitic structure one millimeter from the tooth top and similar to that of the bearing faces. *B, C* and *D* show the hard martensite and the tough troostite (black) at different depths below the surface. Note that the tough and more ductile troostite at the grain boundaries resists shock

This twin-type hardening furnace has an oil quenching tank at the left and a chemical quenching tank at the right

Three teeth ground from a heat-treated railway pinion were bent in a vise by pounding with a heavy hammer without failure. *B* and *C* show the fine grained fracture at the tooth root, while *D* shows the fine grain of the transverse fracture of the tooth

To check the above, one or more forged blanks are taken from each shipment received from the supplier and are tested in the laboratory before being released for production. These tests consist of a chemical analysis for composition, a hot acid macro-etch for amount of upset forging, grain flow, soundness and cleanliness, and a micro-examination of the etched specimens under the microscope for grain size, homogeneity, ingotism, ferrite banding, pearlitic structure and inclusion segregation.

The gears and pinions, after finish machining, are charged into a furnace which has been heated to 900 F., the temperature is raised to the proper hardening range of 1475-1545 F., depending upon the carbon content, mass and design (at the same time maintaining a reducing atmosphere to keep scaling to a minimum), held at the temperature until uniform heat has been maintained for a definite time, and quenched in a well agitated chemical solution to a black heat. Then immediately they are placed in the tempering furnace or hot oil bath, depending upon the application, and drawn to a hardness of 415-514 Brinell (holding to one of three hardness ranges of 415-444 Brinell, 444-477 Brinell, and 477-514 Brinell) depending upon the tooth pitch and service.

The quenching solution is an aqueous solution of several chemicals, each of which has a definite function. The combined effect of the chemicals is to increase the cooling rate, to prevent the formation of steam or gas bubbles on the surface of the steel and thereby pre-

A large ring withdrawn from the hardening furnace is ready to be quenched

vent soft spots, to loosen the small amount of scale on the metal and to produce greater and more uniform depth-hardening.

To obtain a uniform product day in and day out, great emphasis is placed on the technique and science of heat-treating. The furnace temperature at the time of charging is never above 900 F, so as not to heat the cold steel too rapidly. The gears and pinions are so placed in each furnace as to obtain the minimum amount of distortion and to expose the maximum surface area during heating. Supports are placed under the charge to raise it from the furnace bottom, thus allowing more uniform circulation. In heating the temperature is raised gradually and uniformly to the quenching temperature, allowing one hour per inch of heaviest cross-section, and held at this temperature for fifteen minutes. When it is necessary to perform machining operations on certain sections after heat-treatment, or when the design is such that there is danger of failure during quenching, such sections are muffled with suitable plates or special fixtures to prevent hardening. To prevent the items from passing through the dangerous zone of temper-brittleness during quenching, they are removed from the quenching bath while still hot, black heat, and placed immediately in the tempering furnace. This eliminates the probability of quenching cracks and high internal stress concentration developing.

A satisfactory gear or pinion must have a hard bearing surface to enable it to resist wear, it must be tough to prevent fracture, and it must have cohesiveness to resist the tearing out of particles of metal from the surface. The ideal material then for resisting energy loads in service, in which permanent distortion or plastic deformation must not occur, is one having a high elastic strength and a high modulus of resilience. The property of a body by virtue of which work can be done upon it when stressed beyond its elastic limit is called toughness. A tough material is needed, therefore, to resist energy loads when the material in service is likely to be stressed beyond its yield point.

Table I. Physical Properties of Gearing After Special Heat-Treatment (Core Properties)

(1-in. diameter round bars—6 in. long heat-treated, then ground to 0.505 in. diameter tensile test specimens).

	Medium carbon steel casting	Medium carbon steel forging	Alloy steel forging (special)
Tensile strength	115–140000	135–155000	155–175000
Yield point	80–95000	96–110000	130–160000
Elastic limit	65–80000	80–96000	105–120000
% Elongation (in 2 in.)	22–13	22–17	23–18
% Reduction of area	45–25	47–38	60–50
Izod impact	20–10	32–25	40–30
Brinell (core)	206–255	255–293	293–351
Brinell (surface)	375–477	415–514	415–514

Table II. Calculated Physical Properties for Heat-Treated Gear Teeth of Different Pitches (Core Properties—Forgings)

	1 D.P.	2 D.P.	3 D.P.	4 D.P.
Tensile strength	125–135000	145–160000	170–180000	180–200000
Yield point	80–90000	99–112000	125–150000	155–176000
Elastic limit	69–71000	90–102000	108–130000	130–140000
% Elongation (2 in.)	24–21	20–16	10–8	6–4
% Reduction of area	53–49	44–36	32–27	24–18
Izod impact	28–31	27–28	22–26	18–20
Brinell (core)	225–245	255–295	300–325	330–350
Brinell (surface)	415–514	415–514	415–514	415–514

Resistance to Energy Overloads

When a static overload caused by an accident or other cause is applied to a gear, resulting in stresses greater than the elastic strength of the material, the ultimate strength of material determines whether the gear will successfully resist the load or will rupture. On the other hand, if an energy overload, that is, an amount of energy in excess of the resilience of the gear is applied to the gear, thereby causing stresses in the teeth greater than the elastic strength of material, the toughness of material determines whether the energy of the moving body will be absorbed by the member or will rupture the member. In other words, the toughness of a material is a measure of the ultimate energy strength of the material, and it furnishes reserve strength for resisting excessive energy loads. Therefore, toughness and resilience of the heat-treated steel will determine its resistance to overloads, shocks and impacts.

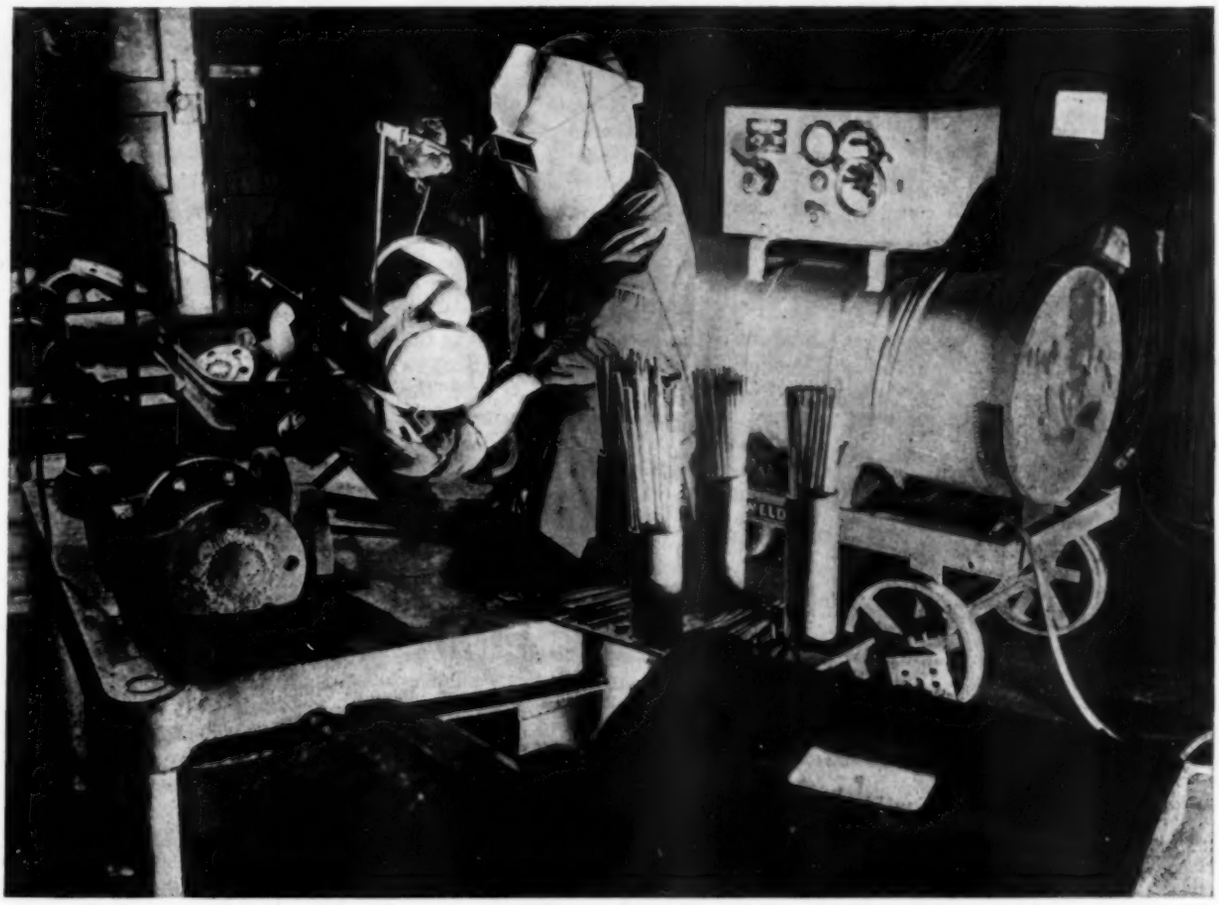
Sometimes the property of hardness is made to include resistance to wear. However, resistance to wear depends upon ductility or plasticity of the material in addition to its strength-hardness. That is, a good wearing steel must resist the displacement of its particles (and hence have hardness) but when they are displaced, it must resist the removal of the particles from the body (and hence have plasticity). Toughness requires both strength and plasticity. Wear resistance, therefore, requires hardness, strength and plasticity.

Table I shows the physical properties of the core of 1-in. diameter test bars, heat treated, and then ground to standard 0.505 in. diameter tensile test bars. These are the core values guaranteed for coupon tests of heat-treated castings and forgings of carbon and alloy steel.

Table II shows the calculated physical properties of the core for heat-treated gear teeth of different pitches. (Effect of mass on physical properties.)

Lower Welding Costs

Use of larger electrodes frequently means lower charges for power, labor and overhead



On production jobs, such as the operations at the plant of the Edward Valve and Manufacturing Company, lowering welding costs even a few cents makes a tremendous difference in factory cost

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BECAUSE of the tremendous strides that have been made recently in improving the welding speed of arc welding generators and electrodes, and the resultant lowering of costs, one fundamental factor in cost reduction has been frequently overlooked. That is the selection of the proper size of welding generator to provide the lowest cost welds.

It is, of course, true that any size machine and any size electrode can be used for welding mild steel. But there is a tremendous difference in the cost of the welds. Some years ago the statement was made that electrodes larger than ⅛ in. could not be satisfactorily used. There still persists in some quarters the feeling that small electrodes are correct and larger electrodes must not be used. The development of shield arc electrodes and large capacity arc welders has, however, changed this so that the selection of the size electrode and the size of arc welders is governed by the character of the work to be done and is not restrained by any question of inherent limitations of electrode size.

The size of the members to be joined, the position of the work during welding, the type of joint are some of the factors to be considered in the selection of the capacity of the arc welder. Where it is possible to use different sizes of electrode, the selection of electrode and arc welder capacity becomes a question of cost.

First let us consider the items that enter into the cost of making a given weld, for example, a butt weld on ⅜-in. plate. There are four of these items, all of which must be studied carefully in order to keep costs at a minimum—power, labor, electrodes, overhead.

Power costs will be determined by whether motor-driven or engine-driven welders are used, by the efficiency of the welding generator and by other considerations such as idling time, idle losses. Since the majority of arc welding is done by motor-generator sets, comparison of power costs will be made on that basis.

We know, for example, that arc welders are, in general, more efficient oper-

ating at high current and at or near their rated capacities. Therefore, power costs should be lowest

1. When using the proper size machine.

2. When welding with the largest size electrode possible.

Here are the efficiency figures for 300, 400 and 600-amp. machines for 40-volt arcs. These figures must be modified to suit the conditions being studied.

Efficiency Chart

Amperage	300-amp. Generator	400-amp. Generator	600-amp. Generator
100	55	..	..
150	..	61	..
200	61	..	60
300	61	66	..
400	59	68	67
600	..	67	67
800	..	..	63

If we are butt welding ⅛-in. plate and using ⅛-in. electrode, we set the machine for 175 amps. and 28 volts at the arc. This gives us 4.9 kw. at the arc. Efficiency is only 51 per cent, however, so we find that we must pay for 9.6 kw. per hour, which at 2 cents per kw.-hr. is 19.2. The burnoff rate for ⅛-in. electrode is 4.28 lb. per hour. Dividing 19.2 by 4.28 we get 4.48 cents —the power cost per pound of electrode burned off. The use of the burnoff rate as a method of comparison is discussed later.

If, on the same application, we use a larger size electrode, we find that our power cost will not be the same. With a ¼-in. electrode at 250 amps. and 30 volts, we use 7.5 kw. at the arc. Efficiency is greater—55 per cent. We find, therefore, that we use 13.6 kw. at a cost of 2 cents or 27.2 cents per hour. Since the burnoff rate is 7.5 lbs. per hour, our power cost per pound is only 3.65 cents.

Our conclusion is that power costs will vary according to the capacity of the welder, its efficiency and the size electrode used. In general, the larger the electrode the lower the power cost.

Another factor affecting power costs is the matter of idling time. A welder equipped with one of the new remote control devices enables the operator to change or adjust the current by merely tapping the electrode on the work. This eliminates the time lost in making trips back and forth to the machine.

If the power cost is divided by some figure which is directly related to the amount of weld metal deposited, comparative figures may be obtained. Such a figure is the burnoff rate. This is the amount of electrode burned off in a given time. It is obvious that the amount of weld metal deposited in a given time is less than this, because of stub end loss, splatter loss, set-up of parts and fatigue. These are so variable that the burnoff rate is used as the basis of calculation. It is to be noted that all figures used make no allowance for set-up or fatigue and so, for a particular job, they must be modified by these items. And for a given job this modification will be approximately the same for all sizes of electrodes, except as given herein (interruptions). If the power is divided by the burnoff rate, the kw.-hr. per pound burned off are obtained.

As a result, the operating factor is increased; there is less power consumed because of the welder running idle. Power costs per pound of metal deposited decrease.

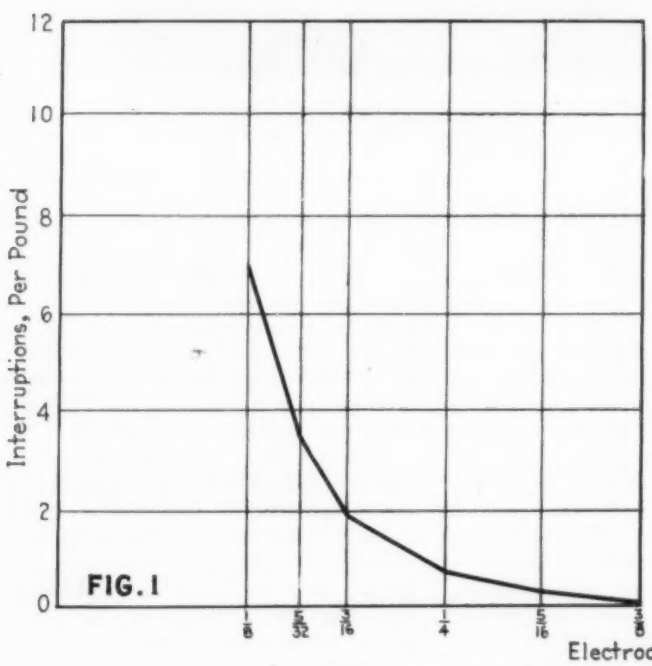
The next consideration is labor. Included in labor costs will be actual welding time, set-up, fatigue, interruptions while changing electrodes and adjusting current and cleaning the bead.

The size welding generator used has a definite bearing on many of these items. A machine which makes possible the use of larger size electrodes provides faster speeds and, therefore, more weld deposit per hour—a decrease in the labor cost per pound of electrode.

With small sized electrodes there are more interruptions caused by changing electrodes. This means that less metal is deposited per hour and labor costs per pound of metal are higher. Fig. 1 shows the number of interruptions per hour with various size electrodes. With labor figured at 75 cents an hour and the time of each interruption as five seconds, this can readily be translated into cost per pound of electrode. It is interesting to compare these costs:

Size of electrode in inches	1/8	5/32	3/16	1/4	5/16	3/8
Cost of interruptions in cents per lb	1.8	1.2	0.8	0.5	0.3	0.2

Set-up time and fatigue will not be influenced to any great degree by the size welder used. With the remote control device mentioned above, there will be a substantial reduction in non-productive time. In some instances, such



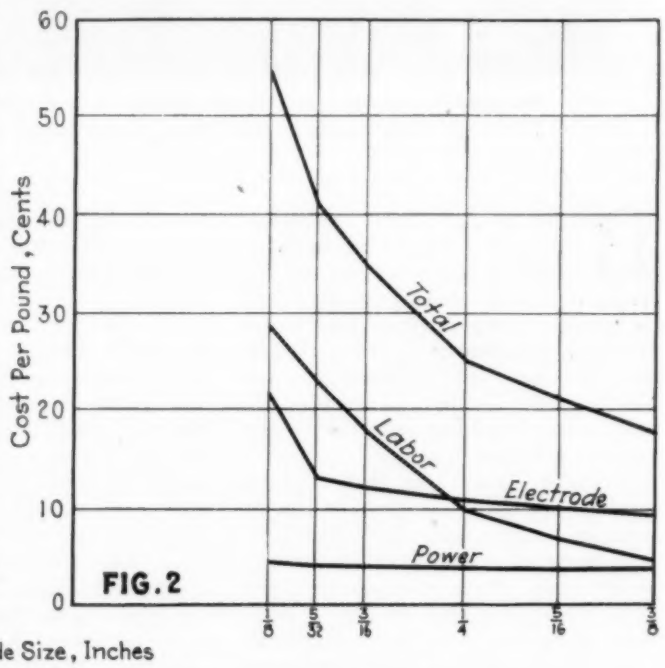


Fig. 1—Relation between electrode size and number of interruptions. Fig. 2—Elements of cost compared to electrode size—no set-up or fatigue allowance included

as in shipbuilding or structural work, labor costs per pound of electrode used are reduced as much as 40 per cent with this device.

Still another labor-saving advantage of larger machines and larger electrodes is the time saved in removing slag from the welds when larger electrodes are used.

The third item going to make up the actual welding cost is the cost of the electrode. Here we must consider the cost per pound, the burnoff rate, the splatter loss and waste ends.

Smaller size electrodes are more expensive per pound. Waste will be approximately the same percentage for either small or large size electrodes. The burnoff rate is a great deal higher for the larger sizes. For example ⅛-in. rods burn off at 2.6 lbs. per hour while ⅜-in. burns off at 16.2 lbs. per hour.

Reducing Overhead

Overhead must also be figured into the cost of our welding. The question arises, "How can larger machines decrease overhead?" Let us say that the capacity of a given welding department is 200 units a day. If with the same number of machines and without increasing the floor space, the personnel or the number of man-hours, we increase the production to 235 units a day, we are proportionately reducing the overhead cost per unit.

Above have been discussed the four items that enter into the cost of welding. By careful selection of welding generators, by using the right size and in most shops this means a larger size generator, welding costs can be lowered appreciably.

Without considering those items such as overhead, idling time, fatigue allowance, many of which vary from job to job, let us tabulate the basic costs—power, labor and electrodes—for various size electrodes. Below are the operating characteristics.

With labor at 75 cents an hour and power at 2 cents per kw.-hr. we arrive at the following cost per pound of electrode on the basis of the burnoff rate of the electrode. No account is taken here of set-up or fatigue time or of savings which might be made by a remote control device which would reduce idle time.

In terms of cost per pound of electrode used we find the following comparison:

Construction of paint and varnish cooking vessels is performed economically by the use of the electric arc

Electrode Size in Inches

	1/8	5/32	3/16	1/4	5/16	3/8
Labor per lb. @ 75 cents an hr	28.80	22.70	17.50	10.00	7.00	4.30
Power @ 1 cent per kw.-hr	4.34	3.94	3.95	3.65	3.50	3.40
Electrode	22.00	13.00	12.00	11.00	10.25	9.50
Cost of interruptions	1.80	1.20	0.80	0.50	0.30	0.20
Total cost per lb. in cents	56.94	40.84	34.25	25.15	21.05	17.40

These same costs are shown graphically on Fig. 2. It is evident that by jumping only one electrode size there is a tremendous saving. For example, when using ⅜-in. electrode in place of 5/16 in., over 15 per cent saving is affected. Using 5/16 in. electrode instead of ¼ in. costs almost 17 per cent less.

When making a jump of two sizes, the savings is, of course, much greater. It will usually be 25 to 30 per cent.

Such savings are possible only when using large size welding machines which have the capacity to handle ¼, 5/16 and ⅜ in. electrodes and which operate at higher efficiencies.

It has been found helpful to make a study of the welding operations in a given plant, figuring the costs per pound of metal on the basis outlined here. Then the amount of welding done with various size electrodes over a period of a year is estimated. This total is compared with the total cost were larger size machines used permitting the use also of larger size electrodes. In most cases the savings will warrant the use of the higher capacity welders.

Electrode Size in Inches

	1/8	5/32	3/16	1/4	5/16	3/8
Amperes	110	130	150	250	325	425
Arc volts	24	25	26	30	34	38
Kw. at arc	2.64	3.25	3.9	7.5	11.1	16.1
Lbs. per hr.*	2.6	3.3	3.95	7.5	10.7	16.2
Efficiency	47	50	51	55	59	59
Sticks per lb.	18	12	8	5	3	2
Interruptions per lb	18	12	8	5	3	2

*Figured on the basis of burnoff rate only.

Gaging With a Friction Tapper—Discussion

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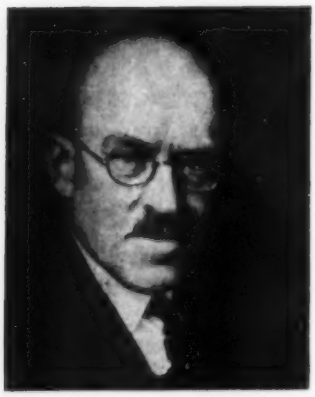
Referring to the article by C. O. Bradford under the title given above (*AM*—Vol. 78, page 290), no wonder the author says that the life of the gage *seems* shorter. It is actually shorter. I have always considered it wrong for a gage to be twisted in a hole.

Obviously, if the gage does not enter the hole freely at the beginning, it should not be pushed further if the strict limits of the gage are to be observed. Thus, the need for twisting action disappears.

In Business Risk Lies Social Safety



RALPH E. FLANDERS
President
Jones & Lamson Machine Company

Mr. Flanders' term on the Industrial Advisory Board of NRA, his years as general manager and president of one of our oldest machine tool companies, his experience as an active engineer among engineers in the A.S.M.E., of which he is the presidential nominee, his reputation as a thoughtful and practical economist, all contribute to the background for this address which approaches the regimentation question boldly and constructively

THE SAFETY of our evolving social order is and must be a primary interest of business. It is evident that business as we know it will languish and disappear if the movements which now menace it pursue an undisputed course. But our serious concern is that with a decay of business enterprise there will be destroyed an accumulating heritage of human values—a heritage which was steadily reaching down into the least fortunate of the social strata, whose worth was only beginning to be revealed, and whose future promise outshone anything offered by rival systems whether in past history, present performance or reasonable future expectation.

I had the privilege recently of describing one of the social safeguards which business is now able to offer and to support, if it is permitted to do so. Business is now able, through appropriate governmental organization, to finance employment or subsistence for every willing unit of our society who is not physically or mentally incapacitated. It may soon be able to do more. But this it can do from this time on, if it is encouraged, or even permitted. Neither the fact of unemployment on any large scale, nor the fear of unemployment, need longer exist in this country.

This belief and the proposals based on it were set forth in a pamphlet entitled "An End to Unemployment" printed by my former associates on the Industrial Advisory Board of the N.R.A. The material appeared also as the leading article in the August issue of "The Nation's Business," monthly journal of the U. S. Chamber of Commerce.

In that pamphlet it was argued that the way out lies in (1) the clearing up of the present confusion between speculative activities and constructive business, (2) the recognition of the essential part played by profit from constructive business in the increase of material wealth and its distribution throughout society, and (3) the formation of such a partnership between constructive business and enlightened politics as shall permit of that abundant and overflowing solution to our problem which neither can hope to accomplish alone. Besides the parts to be played by business and government, it is necessary that labor, finance and other social units shall play theirs, but the major responsibility lies in the joined hands of ourselves and the administration.

A number of needed developments in attitude and policy were suggested. Today we will consider one in particular which lies within the business realm. The subject is one in which we are all interested and in which we differ in our opinions. The point involved is so serious that if we go wrong in respect to it there is little hope for a socially desirable development of our future; while the proper solution will take courage, and freedom from short-sighted self-interest. The topic may be introduced by repeating the following passage:

"Business must not seek to protect itself unduly, but must be willing to undergo the dangers of such a degree of competitive freedom as will insure the orderly and continuous application of improved processes to lowering prices for the general good. Neither private profit nor general well-being will be served in the long run by attempting unduly to safeguard business operation and profit, even for the sake of stabilizing employment. Some measure of uncertainty, some percentage of mortality, is the price of social advance."

We must give some serious and disturbing thought to this question. Al-

Abstract of an address delivered before the American Trade Association Executives, Washington, D. C., Sept. 20, 1934.

most every one of us, directly and instinctively, feels that severe competition is an evil. It keeps us perched for long periods on the sharp knife edge of anxiety. We must plan instead of loaf. We must calculate instead of daydream. It is easy to plan and calculate amiss, and fatally easy to lose thereby our precarious foothold and plunge into the abyss of failure.

Yet there occur for many of us periods of ease and prosperity. These may be due to the chance of a lucky guess, to being "on the elevator when it is going up," or to fortunate changes in business demand which we are in a position to supply; or they may really be due to good judgment, organizing ability and technical skill. Success comes both ways. The point is that we are prone to feel that easeful success is the natural and attainable state of business, that the sum of the competitive problems of individual business constitutes the problem facing business as a whole, and that in consequence the recovery of business depends on the control of competition.

Value of Insecurity

Completely to the contrary, we must be prepared to consider whether the health of business as a whole and the general prosperity of society may not depend on a considerable measure of insecurity for the individual business; and whether our present efforts to protect whole industries from competition may not both delay recovery, and render inevitable a governmental dictatorship (real, even though disguised or unacknowledged) which will choke the rapid advance of our productivity and slow up or diminish the distribution of its products as a raised standard of living for the masses of the people.

As to the health of society as a whole there can be little question, when looked at from the purely material standpoint. The raising of the standard of living in its tangible elements—food, clothing, shelter, automobiles, radios, organized amusement—has been most effective during periods of activity combined with competition. This competition was carried out in terms of lowered price and expanded output, and little of that output failed to reach the consumer's hands. Even in the case of such intangibles as education and public institutions, museums, hospitals and the like—the era of competition has left behind it a cultural deposit at which this chastened generation may well look with wistful eyes.

But we must not blind ourselves to the debit entries on the balance sheet. The turmoil of competition takes place in an atmosphere of tension and anxiety. For leadership, whether in business, in politics or finance, there must always be tension. There is no leadership without it. That is the price the leader pays. There need be little anxiety if there is vision and courage. The bad element of those competitive times lay in the fact that the tension and anxiety descended below the rank of leadership and permeated the mass of society. This was bad, for it is the office and crown of leadership to relieve tension and anxiety in those who are led. Our problem is then to preserve the social fruits of vital competition without laying burdens thereby on the mass of the population.

First we may consider as to whether there have been forms of competition in the past in which for society as a whole the debit account has wiped out the credit. One example we may point out without hesitation.

Competition is a social danger when it takes the form of prices lowered by the cutting of wages below subsistence standards. When the only way to survive is to cut wages below competitors who are already paying sweat rates, the social desirability of survival is doubtful. Large areas of the needle trades were in this condition previous to the N. R. A., though over the preceding decades conditions had been improving rather than the reverse, due to combined union activity and the development of a social conscience.

But this same endeavor to protect wages may be carried to a socially undesirable degree as has been done, for instance, in the building trades.

The major part of the persisting unemployment is located in the capital goods industries. More than half of the unemployment in these industries is to be found in the building trades.

Competition is a social danger when it takes the form of prices lowered by the cutting of wages below subsistence standards. When the only way to survive is to cut wages below competitors who are already paying sweat rates, the social desirability of survival is doubtful.

Now the building trades constitute the outstanding success of trades union policy and philosophy in this country today. These unions and their leaders have protected their members with the shortest hours and highest wages that are enjoyed by any workers, unless it be among the railroad brotherhoods. But this success of union policy has delayed recovery in business as a whole, and has kept its individual membership out of work. It is so out of step with other industries that under union conditions building is not profitable where true business profit is sought. Building is only profitable where a speculative profit is hoped for. As a consequence the concentration of building in our boom periods constitutes one of the serious elements in economic unstability, as does its corresponding heaviness in recovery. And the individual union member suffers thereby. If he is making a living at the present time it is as likely to be by tending a gas station, running a taxicab or by working clandestinely under non-union conditions.

Briefly, competition should be prevented from driving wages below a reasonable subsistence level, and hours should not be permitted to exceed humanly desirable limits which keep in view the standard of living available and desired. As we make rigid provision beyond this point we tend to approach the unsocial and uneconomic conditions now existing in the building trades, and in some others.

Unions May Be Good

Still more briefly, we can say that the labor union may be a good thing if it isn't too successful according to its own standards.

Lest this guarded statement elicit premature approval from some of you, let me say that I hope to show that the same thing is true of the trade association, or of industry organized under the codes. Such an association or organization may be a good one, socially and economically, if it isn't too successful and doesn't go too far.

In the criticism of trades union policy a particular group of unions was named. If we are to play fair, we must take a specific example from the N.R.A. in drawing our parallel. The lumber code is a case in point.

This code is not only interesting, it is admirable in many respects. For one thing, its price protection provisions are applied to a natural resource, whose preservation and economic use is fraught with a particular social interest. The price of timber on the stump is in a category differing from that of mouth-organs in a Woolworth store.

In the second place, a truly wonderful task of co-ordination throughout the whole industry was carried out by those who devised the code and secured its adoption. All of the elements involved were welded into a homogeneous organization. This is as far removed as possible from the separate unions of the building trades group with their separate jurisdictions and jurisdictional disputes, such as the disgraceful one which hindered the completion of the new government buildings in Washington, or the

ludicrous one which prevented the completion of the monument to Samuel Gompers until too late for its dedication.

Finally, the code is having expert and far-sighted administration, so far as a by-stander can judge. Although its provisions for price protection extend all the way from the stump to the finished mill-work on the building lot, those responsible for it have not let the code rest as a finished, immutable and imperishable monument. When it became evident that the resulting increase in lumber prices, added to the already heavy labor costs and the high land values (this last is a topic in itself) was restricting the esential recovery in construction the code authority took steps to reduce prices by the substantial figure of 15 per cent. The building trades stood pat, except as they permitted local unions some latitude in local negotiations.

It is difficult for us as individual business men to see competition as anything but an evil. And so we grasp at the chance offered by the codes to free ourselves from its annoyances and dangers and seek protection in an ordered and controlled business economy. The bait is tempting, but the trap is strong, swift and sharp; and the bait is poisoned. Mr. Tugwell knows, and we will learn, that safety and ease are purchased at the cost of governmental regulation.

Yet with all its excellences, we have here a new and doubtful institution—a legalized association which gives price protection to all its members, and in so doing introduces rigidity into what had been a flexible price structure. Automatic adjustments to new conditions are banned, the judgment and wisdom of human beings are substituted. These human beings have to decide for a whole industry what shall be the proper return for each element in the chain, whether the end price shall be maintained to protect the weak, or lowered to get business. The pressure on them to protect the inefficient will be tremendous, as it has been in the case of the unions. Yet if they do so, and prices are abnormally protected, output will be cut down, employment diminished, production and distribution of wealth slowed up and the standard of living depressed.

Code theory, in its full development, is thus on all fours with trades union theory. Its purpose is to assure income to the whole group. There was a clear intent in the drafting of the recovery act to permit a lessening of competition and an increase in agreement and cooperation to a degree previously illegal, in return for a socially desirable minimum wage provision on the one hand, and a socially dubious official support of trades unions on the other. Trades union theory and industrial organization theory were to be put on a parity, with the expectation that a lusty recovery would be the natural offspring of the curious alliance.

Our legislators cannot be blamed for this. It was the business men who were most thoroughly sold on the idea that recovery and continued prosperity depend on the restraint of competition.

Business to the Efficient

All of this makes for a very different world from that of the "entrepreneur" in the technical economic sense, or of the "business man" if we are to use the language of the street. The business man of the past was entitled to protection because he was willing to take risks and because his risks were obviously in the public interest. His taking of risk, unprotected by code provisions, meant that there was a high mortality among the riskers; but in the aggregate and in the long run the result was the falling of business into the hands of the efficient, and the sale of goods and services to the public at a lowering price. Finally, the industry itself had its maximum of protection against competing industries.

There is no such protection to the public or to the industry in a universal extension of the practices of the lumber code. Inevitably the government must be the arbiter, as it would have been long since in the building trades unions and others like them, if their superior political acumen and power had not protected them. Business, without these qualities, is an easy prey for the future.

Nor is there hope for a vitally expanding industry and a rising and better distributed standard of living in the best possible governmental supervision or control. The control will be no better than the aggregate of the individual controllers; the quality of this aggregate will fall far short of the best of these individuals composing it; and the best of these, in turn, cannot be good enough to function even in a small area as well as have the outmoded forces of competition.

The arguments for competition are many and are based on experience. The arguments for arbitrary control (into which we are being drawn with accelerated velocity) are few, dubious and based on hopes, not experience.

Competition is the democratic method of industrial control. It is based on dollar votes in the hands of the public; and those votes are made effective, through the profit motive, in determining what goods and how much shall be provided to meet the needs, wants and whims of the population. It is a quickly responsive mechanism, and no arbitrary control can take its place in any way as satisfactory to the great mass of our fellowmen.

But in spite of its excellent record, competition is in disfavor on two counts. It is said to have failed in providing the population with the dollar votes for making effective selection of the goods it desires; and it is said to be a waning force, soon to die of natural causes, which must perforce be replaced by artificial substitutes.

As to the first, the answer is short. Competition, and the profit motive which activates it, have behind them in the last century a record of material progress which is unparalleled in the history of civilization. In no past time has the common man had the material goods with which our time and our system have provided him.

But the common man is unsatisfied with his share of dollar votes—mildly dissatisfied in good times, deeply and desperately so in depression. It is *not* the operation of competition in productive business which has failed him. He has been cheated, as have those who would gladly give him more and higher-paid employment, by the injection of billions of credit-currency into the business system, first by governmental war financing, and second by inflationary speculation. A redistribution of material wealth was effected thereby into the hands of those who have rendered no business service, and there followed therefrom the subsequent and inevitable destruction of this purchasing power by deflation. In the face of such a social disaster, what are the minor annoyances attending the operations of competition in business? The legislators or government officials who look on that disaster, and then use it as the excuse for throttling productive business, are enemies alike of the worker and of his employer.

Competition Helps Worker

To conclude this point, the greatest progress of the worker in real income (expressed in the volume of goods and services made available to him) has always taken place in the periods of active healthy competition. His best hope for the future lies in a return to and an extension of those same conditions.

But there still remains a weighty weapon in the armament of those who would build a new order on the deliberately ruined remains of the old. Competition, they tell us, is actually a thing of the past. It is beyond reviving.

The current protagonist of this view is Mr. Rexford Tugwell, Assistant Secretary of Agriculture. In recent articles in the Sunday Magaine of the New York *Herald Tribune* he has correctly described how competition, acting through the price system, has controlled production and distribution in accordance with the abundance or parsimony of nature, the efficiency or inefficiency of business and the changing wants of the consumer. He has detailed the accumulated restraints on the free market with its flexible prices—the increase in size and power of business organizations, the frequency of secret understandings and, since the codes came in, the proliferation of legalized price control. (He does not mention the rigidities of union wage scales.) From all of this he infers that the competitive price system had already broken down in the last boom, and that this breakdown was an effective agent in the collapse; and that the continued degeneration of the system since then renders any return impossible. Neither inference is justified.

On the contrary price competition was effective up to the last, over so large a percentage of total business that it remained the normal element of control. The abnormal element which destroyed this control was, as we have seen, the invasion of productive business by speculative inflation.

But when Mr. Tugwell tells of the decay of the competitive price system under the codes he is on solid ground. This is the really dangerous element in the progressive disintegration and surrender of business initiative. *This is the damage we are doing to ourselves.*

Bureaudom's Price

The temptation is great. As already noted, it is difficult for us as individual business men to see competition as anything but an evil. And so we grasp at the chance offered by the codes to free ourselves from its annoyances and dangers and seek protection in an ordered and controlled business economy. The bait is tempting, but the trap is strong, swift and sharp; and the bait is poisoned. Mr. Tugwell knows, and we will learn, that safety and ease are purchased at the cost of governmental regulation. He does not realize that there is a price to be paid by the general public as well. There is developing an inevitable loss of efficiency, a growth in wasteful bureaucracy, an asphyxiation of constructive private effort and a resulting decrease in the general standard of living. This will be a heavy price for the worker of this country to pay for a transient sense of security for himself or for a similar illusion on the part of the business man.

What then is our duty as business men? Our first duty is that of a change of attitude—of our whole business philosophy. We must reverse our surrender of independence and must discard such plans as we have made for a safe and inglorious business future. We must gladly and willingly risk the old dangers, for only in the face of those dangers is real safety to be found. Business men must not themselves succumb to the more short-sighted of trades-union ideals.

To get down to practical details, there is much in the codes that we will want to throw away, but much that we will want to save.

Keep Minimum Wages

We will preserve the minimum wage clauses, though perhaps more carefully studying the problems of regional variations and the desirable variations as between urban and rural conditions. If the administration will whole-heartedly encourage private profit and private initiative, we may look forward to a general raising of these minimums.

We will oppose further shortening of the hours, as destructive of hopes for a raised standard of living. It is doubtful if the pitiably low standard of 1929 can be reproduced on a 40-hour week. Further shortening will put the same sort of a brake on recovery and prosperity that is now effective in the case of the building trades.

The child labor clause at 16 years must be preserved and enforced; but attempts to raise the limit beyond that age must be vigorously fought in the interest of the youths themselves—and with no other interest whatsoever, conscious or unconscious.

Open prices must not merely be permitted, they must be enforced. There are ways of preventing open prices from becoming fixed prices. In some industries it will be done by eliminating the waiting period entirely, in other cases by eliminating it for decreases but retaining it for price raises. Every proper provision should be made for quantity discounts, or for lower prices on goods made out of season, or for any other economically sound concession to the large or astute buyer. But secret prices must go.

Certain of the "unfair practices" clauses should be retained, discarding the great mass which looks toward a restriction of effective competition. Bribery, dishonesty—these are obviously out of place in self-respecting business.

Other harmful practices have grown up as trade customs in certain industries. As an example, there is the privilege of countermanding an order, which in the woolen industry reached the limit of returning for full credit goods on the purchasers' shelves, unsold at the end of the season. An order is a contract, and should be so considered.

The unfair advantages of size should be forbidden as, for instance, the piecemeal destruction of competition by price cutting below cost in restricted areas, while recouping by increased prices elsewhere.

Our hardest task is to put in effective operative form that community of interest which subsists between the workers and the industry in which they are employed. On the false trails both have been following, by way of super-organization and destruction of competition, both groups find themselves faced with the loss of their dearest attainments and hopes. Together we are being deprived of the material values of a raised standard of living, and the spiritual values of liberty. The form of our needed co-operation is not clear. Perhaps the need is not so much for formal co-operation as for direct recognition of these mutual interests.

Our first duty is that of a change of attitude—of our whole business philosophy. We must reverse our surrender of independence and must discard such plans as we have made for a safe and inglorious business future. We must gladly and willingly risk the old dangers, for only in the face of those dangers is real safety to be found. Business men must not themselves succumb to the more short-sighted of trades union ideals.

As to other particulars it is possible to look ahead more clearly and with assurance.

We can so arrange that the larger monetary rewards shall more nearly represent equivalent service to society and shall act as effective distributors of purchasing power.

We can provide subsistence and lift the fear of want for his dependents from the soul of every willing worker in this land.

We can keep open and enlarge the door of opportunity to every youth with the will and capacity for social service, whether in business, the professions or the arts.

We can increase the general standard of living, and distribute it on a more equitable basis.

All this and more we can do. But if these things are to be done, we who are devoted to the discipline of business must direct our steps anew toward an ascending pathway.

Several reheatings to forging temperature are needed to form the stock to finished shape

Steps in Forging Weldless Jars

J. B. NEALEY
American Gas Association

Experience is combined with good equipment to form intricate hammer forgings at the Spang & Company plant

MOST of the arts have been transformed into exact sciences, in recent years, but good forging stubbornly resists complete mechanization. True, giant power hammers and intricate dies have gone a long way toward eliminating the human equation in the forming phase of the process, and there are now available correctly designed furnaces, fired with refined fuel gas, which heat with almost absolute uniformity and practically without decarbonization. However, it is this heating phase, the key point in the entire process, that still calls for craftsmanship of the highest order.

Few forge furnaces are equipped with temperature controls; the forger depends upon his experience and eye to tell him when the furnace is properly heated and when the steel is at the correct temperature for forging. Different forgers use various methods, one of the most common being the color of the steel. The color changes vary greatly with the differences in outside light, which may range from sunshine through dark rainy weather to black midnight with artificial lighting. All this is complicated still further by the use of many alloy steels contrasted with plain carbon steel in former years.

Another way of telling temperature is by watching the scale. If the fuel mixture is nicely adjusted so that all of the oxygen is burned up (reducing) the scale will form slowly, be relatively thin, and at the proper forging temperature, will raise in small blisters. These blisters then start to become incandescent, and this is the point at which the steel should be removed and put in the forge. If left in the furnace the scale becomes incandescent, thickens or grows and then starts to run as slag thus wasting the steel and endangering its soundness.

When enough time is allowed for proper development of the heat, the steel will become fully plastic without using the commonly called melting heat. At the correct heat, properly developed in a well-designed furnace with the right mixture of gas and air, the scale will readily free itself for blowing off as it is worked in the hammers and it will have a fine-grained, satin-appearing texture. On most steels scale that sticks denotes that the steel was either too hot or too cold or that the fuel mixture was too lean (surplus of air or oxygen).

If the steel is too hot the scale will be thick and porous, but if the proper heat and fuel mixture is used it will have a shiny, damp appearance. A too thin mixture will cause it to look spongy, dull and dry.

Spang & Company, manufacturer of gas and oil well drilling and fishing tools, has developed a technique for making one of the heaviest and most intricate forgings known, a weldless jar. In finished form this consists of two heavy interlocked links, forged from a single piece. A high carbon steel is used. For

one of the larger sizes of these the billet weighs 1,400 lb. and the finished jar 1,000 lb.

The billet is preheated to 900 F., allowed to soak overnight and is then brought up to temperature, 2150-2200 F., during a four-hour period in the morning. The preheating furnace is cold when charged. All forging furnaces here are of brick and refractory block construction, insulated, steel incased and fired with gas burners of the blower-mixing type. They are made portable so that they can be easily lifted by crane and shifted to any location in the plant. There are between 25 and 30 of these forging furnaces, of all sizes and shapes, some being of the slot type while others are equipped with doors for the admission of larger work. Each is fired by one or more burners and is equipped with one or more air blowers.

Several of these furnaces are 8 ft. long, 5 ft. wide and 4 ft. high with gas burners on one side, firing tangentially to the arch. Some of these have a door at each end and will heat stock for two crews. Others are from 18 to 20 ft. in length. Using an airblast and blower mixing burners it is easy to adjust the volume flow and to regulate the gas-air mixture.

Sequence of Operations

Operations in forging the weldless jar are as follows:

1. Preheat to 900 F. overnight and bring up to 2150-2200 F. in another furnace (4 hours). Block out under a 4,000 lb. hammer. The temperature drops to 1600-1650 F. which is too cold for longer working.

2. Reheat to 2150-2200 F. which requires about 1½ hours and drop forge with several more minutes of working in a 6,000 and a 12,000 lb. hammer.

3. Trim and punch in a 300-ton hydraulic press with the aid of a loose, heart-shaped cutting iron. The center or junction is severed in a small open frame hammer with a manually held wedge.

4. Smooth out shear marks in swing grinders.

5. Reheat severed sections, known as knocking heads, by doubling the two links back on themselves with the knocking heads together. The preheat is at 600 F. for 3 or 4 hours and the high heat 2100 F. requiring 1½ to 2 hours. Block in open frame hammer (1100 lb.) to lengthen knocking heads.

6. Reheat (30 min.) and finish drop forge the knocking heads.

7. Pickle in sulphuric acid solution. Inspect.

8. Grind on swing grinders.

9. Heat jar body and close reins in 1500-lb. hammer.

10. Heat box and pin ends and finish under the same hammer.

11. Cool, pickle and regrind. Inspect.

12. Heat-treat. Forgings are first charged into a warming oven and left at 250 F. overnight to remove the chill. This oven is 12 ft. in all dimensions and is heated by atmospheric gas pipe burners (below the floor). The work is charged on cars which run on three tracks in the oven. Each car holds five upright sections of 12-in. pipe and a jar is placed in each of these. They are rolled to the furnaces on a single track and are put in with swing post crane and hoist, the crane being rotated by motor.

13. Heat in the high-heat furnaces for 24 hours and then quench in water to refine the grain structure. These furnaces are cylindrical in shape, 18 ft. high and 10 ft. in diameter. Each is heated with several gas burners, already described, spaced equally about the wall of the furnace and firing tangentially to the inner surface of the wall. Temperature cycles are charted by a recording pyrometer. At the end of the heating period the hot forgings are transferred to a steel quenching tank of about the size and shape of the furnaces.

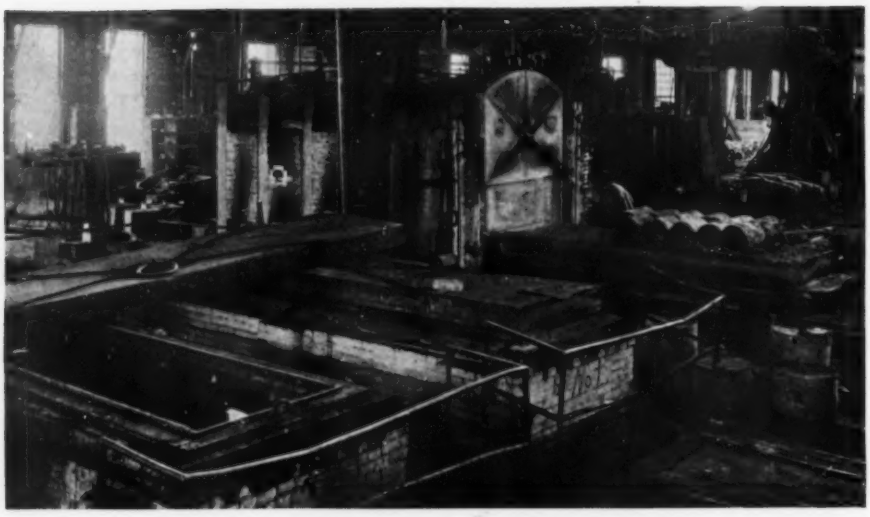
14. Draw in triple operation. First entire forging is put into a salt bath of which there are two, each being 20 ft. long, 6 ft. wide and 4 ft. deep. A kettle sets in each of these furnaces and heat

Portable heating furnaces are located conveniently near the hammer crews

Ends of weldless jars are reheated for the final forging operation. At the right may be seen a special buggy for handling the work

Final forming is done under a drop hammer using a rather intricate forging die

Gas-fired circular furnaces are employed for heat-treating weldless jobs after forging



Two salt baths are used for drawing with a car type carburizing furnace in the background. Following the salt bath draw the ends are given a higher temperature draw in lead baths to permit threading

is supplied by a single gas burner in each end. The ends of the forgings are then drawn in lead baths of which there are two.

15. The final operation is machining and threading the ends.

The lead bath furnaces are 8 ft. long, 3 ft. wide and 3 ft. high and hold pots 24-in. deep. Each is fired with a gas burner at each end. A motor driven blower furnishes a premixed gas-air mixture to the burners through a manifold which completely encircles the furnace and cuts back in on itself. In this way a continuous circulation of fuel is set up in the manifold which, in turn, equalizes the fuel pressure to both burners. As only the ends of the jars are treated, the jars are suspended from steel supporting frames.

There are other furnaces quite similar in construction but somewhat larger with suspension frames 15 ft. high which are used in treating drill rod ends. Holes in the roofs of these furnaces have circular steel covers filled with refractory material and with holes in the centers just large enough for the drills to project down through. The heat-treatment just outlined was developed to produce a combination of physical characteristics suitable to withstand the rigid requirements of oil and gas well drilling.

Car-Type Furnaces Used

Carburizing, annealing and other heat-treatments are performed in two furnaces of the car bottom type, which face each other so that a single track serves both. The space between the two is about 25 ft. and each is 20 ft. long, 10 ft. wide and 6 ft. high. The cars are moved by motor driven windlass and chain. Heat is supplied by three gas burners, located on one side, each firing vertically straight up into flues with checker work. The furnaces are composed of double refractory walls with a space between, and this construction extends through the roof with the flues and checker work between so that the hot products of combustion rise, pass across, down the other side and out through a stack. The gas burners are served with a single manifold and blower.

Formerly the firing equipment of all the furnaces in this plant received air under pressure from one huge blower operated by a 50-hp. motor. This central system was given up and each furnace was equipped with a separate blower, so as to avoid running a 50-hp. motor when only a few of the furnaces were being used. In addition to this saving, the gross load was decreased for the combined power of all the individual motors now totals less than 20 hp.

Heat-Treating in the Small Shop

FRED H. COLVIN
Editor, American Machinist

ALMOST EVERY shop has some heat treating to be done. Even if you use tool bits in tool holders or forged tools that don't have to be tempered, you are sure to have some jobs that need heat-treatment of some sort. If you have intricate punches, dies or other tools, or a lot of production pieces to be hardened, the chances are it will pay to send them to a shop that specializes in such work. In any case, however, you want to know something about hardening and tempering steel of various kinds. And it is especially important to know the kind of steel you are handling. Keep the steels separate, or mark them plainly so you will have no doubt as to which is which. Consult the maker or follow his instructions until you find a better way to handle the steel, as sometimes happens.

Generally speaking, a coal-fired furnace is out of the picture at present. Oil or gas will probably be selected in most places. But where current is cheap the electric furnace may be selected. They will all do good work when properly handled. Experience seems to indicate that either gas or electric furnaces can be very closely controlled as to temperature, and that cost is apt to be the deciding factor. This of course includes both first cost, cost of operation and upkeep.

Temperature control is also a very important item in heat-treating, and even the small shop needs good instruments that will show the furnace temperature. Recording apparatus is very convenient at times but is not a necessity except in repetition work. But, while we know that steel treaters in the past have done splendid work without a pyrometer, in judging temperature by color, the eye cannot be as accurate as a good instrument and it is handicapped by changes in light conditions. Darkened windows are used in the attempt to give the hardener constant light conditions, but with a good pyrometer all this is avoided and more uniform results are assured. High speed steels, whose chief characteristic is in remaining hard at temperatures that would soften carbon steel, are used laregly as cutting tools, and it pays to know of some of the developments in hardening practice. Well-known, high-speed steels, by different makers, fall into what is known as the 18-4-1 class. The 18 is tungsten, the 4 is chromium and the 1 is vanadium. The tungsten is for making the steel hard and to resist the softening effect of heat. Chromium helps it resist shocks, while the vanadium gives it fatigue-resisting qualities and purifies the whole mixture.

Higher Heats Now Used

Until a few years ago it was considered good practice to heat this steel up to 2,200 deg. F. and quench. Indications now point to the use of a higher temperature with good results. A number of experienced steel men now recommend heating this steel up to 2,350 or 2,450 deg. F. before quenching. The tools are then drawn to 1,100 deg. F. This gives a Rockwell hardness of about 63, which is 4 to 5 points higher than when the same steel is heated to only 2,200 deg. F. A well-known metallurgist expresses the belief that a lathe tool of 18-4-1, heated to 2,400 deg. F. before quenching, would have double the life of a tool only heated to 2,200 deg. F. Others put the increase in life at a higher figure. With super-high-speed steels in which cobalt is used the heating temperature runs up to 2,400 to 2,450 deg. F. before quenching. Whether you use these steels now or not, it is well to bear in mind that you may need these high temperatures in the future and put in a furnace that will give it, if and when you need it.

Milling cutters and similar tools will not stand the high heat of lathe tools without danger of burning the cutting edges. Some makers, however, heat such cutters to 2,350 deg. F. and draw to 1,100 deg. F. This gives a Rockwell hardness of about 63 which is equivalent to about 650 Brinell, and about 90 scleroscope. These equivalents are not exact but serve as a guide. Harder than this the tools are apt to be brittle, and toughness is necessary for cutting at modern speeds.

Time of heating is also important. With lathe and similar tools there is much less danger of burning than with cutters of various kinds. But steel experts agree that steel should be removed from the furnace as soon as it has actually reached the desired heat. The trouble is that the pyrometer usually shows the temperature of the furnace and not of the steel and it takes time to heat up the steel, especially if it is a large piece.

Then, too, the outside of the piece heats first and if a large milling cutter were to stay in the furnace until the center reached 2,350, the teeth might easily be burned. So the usual practice is to heat slowly in a pre-heat furnace up to about 1,750 deg. F. and then heat rapidly in a high-heat chamber to 2,350 deg. F., quenching the piece as soon as it reaches that temperature. The following suggestions are given for heating high speed lathe tools.

For 18-4-1 high speed steel a steel man recommends the following heat treatment for lathe tools of both in the solid forged and tool bit form.

First preheat the tools to 1,600 deg. F. for 20 min. Then heat to 2,400 deg. F. and hold them at this heat for length of time given for each size of tool.

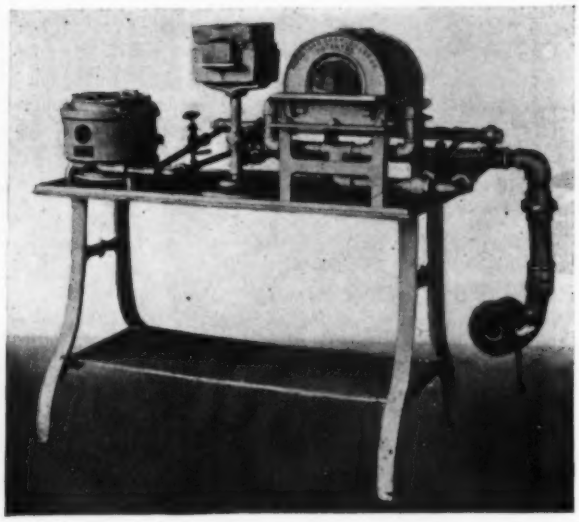
Solid forged tools:
- ½ x ¾ in. 2 min.
- ¾ x 1⅛ in. 2½ min.
- 1¼ x 1⅞ in 3 min.

Tool bits:
- ⅜ x ⅜ in. 1½ min.
- ½ x ½ in. 2 min.
- ⅝ x ⅝ in. 2¼ min.

All are quenched in oil and drawn to 1,050 deg. F. being held at this heat for 2 hr. This treatment is supposed to give the maximum cutting ability and long life to the tools.

Tests at the Bureau of Standards used ¼ x ½ in. tools, keeping at the high heat for 1½ min. The temperature was 2,400 to 2,445 deg. F.

Furnace atmosphere also has its effect. A piece of wood placed in the furnace smoulders when the atmosphere is right but bursts into flame when there is too much oxygen. Too much oxygen pro-



Typical of the equipment available to the small shop is this group of gas-fired heat-treating units. An oven furnace, a forging furnace and a pot furnace are illustrated.

duces scale and tends to alter the grain structure of the steel.

The illustration shows a group of small furnaces made by the American Gas Furnace Company for use in small shops. The unit includes an oven furnace at the right of the bench, a furnace to heat for forging in the center and a pot furnace at the left. A blower is seen at the extreme right with a connection ready for the current socket. By connecting the gas the whole unit is ready for operation.

The oven furnace can have a muffle, approximately 2¾x4¼x7½ in. or with a hearth slab of the same space. The forging furnace is 2x3x4 in., the end bricks being removable. The pot is 6 in. diameter by 5 in. deep and can be used for lead or cyanide hardening, or for drawing in lead or oil. Other types of furnaces are also available but this makes a compact heat-treating unit for the small shop.

Cooling is by oil both at 150 to 200 deg. F. or in air. After heating to the desired temperature for drawing, the tools should be cooled in air. All tools should be drawn as soon after cooling as possible to relieve internal stresses in the steel. This may not be absolutely necessary for single-point tools but it is vital for cutters, dies, or any work having corners or intricate shapes. Many dies have been cracked by leaving them until the next day before drawing.

Three-Point Support for Lathes

R. J. WALKER
Lieutenant Commander, U. S. Navy

Should lathes of moderate length have three-point support?

The Navy has 550 lathes installed aboard its vessels. The merchant service has many more. New design in building ships calls for lighter and lighter construction. As a result the foundations on which lathes aboard ships are installed will in the future be less rigid than heretofore. New machinery design calls for higher and higher speeds, hence greater accuracy is demanded in the machining and manufacture of parts.

A lathe may be of the very best design and construction but if it has four or more supports by which it is secured to its foundation it will no longer remain accurate if the foundation under the lathe changes its shape. The deck of a ship not only weaves in a seaway but changes with varying amounts of fuel on hand, or loading from other sources.

An 18-in. engine lathe installed on the U.S.S. Houston, a heavy cruiser, some four years previously and presumably accurately aligned upon the date of installation, was recently found to require a 1¼ in. shim under one foot to take the twist out of the bed. This was discovered when the ship was in dry dock.

Installing lathes accurately when a ship is afloat is difficult, since a sensitive spirit level cannot be used for leveling purposes. The best condition for leveling and securing lathes on board ship is when the ship is at rest in a fixed position on blocks in a dry dock. However, when the ship again becomes water borne the foundation on which the lathe rests is likely to assume a changed alignment.

Those who go to sea are not the only ones interested in lathe foundations. Many machine shops are located on made ground. Such ground continues to settle over a long period of years. Four or five years after a lathe is installed on made ground its bed will generally be found to be distorted or twisted, unless its foundation is very well constructed.

In 1929 while inspecting the machine shop at the Navy Yard in Philadelphia it was noted that the machine shop floor was in waves and in many places cracked —a condition arising from the fact that the floor had not been properly constructed and piled. The lathes were tested for twist with a sensitive level, and some had to have as much as a ⅜-in. shim under one foot to restore them to normal. Piling and laying a heavy reinforced concrete floor is expensive. If the design of a lathe allows it to rest on three feet it is believed that such heavy reinforcement of floors should not be necessary. Of course, lathes of considerable length would require special foundations.

Large machine shops often have many lathes installed in galleries. These galleries may be supported in some cases by the same columns which carry the heavy traveling-crane tracks. Whenever the crane goes by under such a condition it throws the lathe near it out of alignment, perhaps only slightly. Such may be easily noted by placing a spirit level on the lathe bed and watching the bubble as the crane travels.

Lathes at present are not rigidly enough designed to allow the feet at the tail stock end to be supported by a central point. It is believed that in the future as greater accuracy is demanded of short and moderate length lathes their design will be along lines freeing them from the needs of being supported by more than three feet.

High-Speed Tool Tips

Tipping of carbon steel shanks with high speed steel cutting edges is said to secure better results than a tool made entirely of high speed steel. According to those who specialize in cutting tool data the answer lies in the better conductivity of the carbon steel, which keeps the cutting edge cooler than where the shank is of the same material. Does anyone know of a better reason?

EDITORIALS

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EDITORS

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NEW DEAL—OR WHAT?

ON THE invitation of President Roosevelt, and with the express understanding that recovery was to be accomplished by cooperation between industry, labor and the government, business men and manufacturers entered wholeheartedly into the NRA program and worked their heads off in sweltering Washington to do their part in the recovery effort.

The Administration representatives worked equally hard — at first. More recently the original idea of cooperation seems to have lost favor.

Labor, as represented by its organized minority, worked hardest of all—to turn the Recovery Act to its own ends. And those ends, of course, were more members, and more dues to support the most effective lobby in Washington.

The inevitability of what has happened seems to have been clear to very few business men a year ago. Today it is painfully apparent, and business men generally are disillusioned and discouraged.

Organized labor's attitude and actions are easy to understand, and every manufacturer who has ever had a strike will take them as a matter of course. But the complete turnabout of the Administration, after its protests of intent to cooperate is something else. In contrast, labor leaders have at least been consistent.

If the disappointments of NRA were the only ones to come to industry they might be accepted with some fortitude, but they are accompanied by economic experiments in monetary control, in socialized manufacturing, in developments of power for which there is no immediate market, that disregard every established principle of sound business and economic theory and practice.

No wonder business men are apprehensive. They know from bitter experience that expenditures have to be balanced by income. They know also that the New Deal experiments will have to be paid for out of taxes, and that business will have to pay the bulk of those taxes. And they sense the imminence of old-age pension and unemployment insurance legislation, highly desirable as a long-range objective, but almost sure to be immediately fatal to industry if the costs are piled on top of the other taxes which must support the New Deal during the next year or so.

BUT BLIND opposition does no good. It simply results in the calling of hard names by the insiders, who will brook no opposition. Business must present a substitute program that has some chance of achieving the constructive objectives which the New Deal set up but has not attained. If it is necessary to employ its own full-time "brain trust" to formulate the program, because of the inability of its leaders to leave their own affairs to drift, it should do so.

But let's be sure, before any thought is given to a substitute plan, that no one has the idea that the way to progress is to walk backward. Business demands a fairer deal than the New Deal has turned out to be, and a deal different from anything we have had thus far.

Overdoing It

IN HIS thoughtful paper before the Trade Association Executives, which we are privileged to abstract in this issue, Ralph E. Flanders performs a real service in defining clearly some of the troubles that are obscuring the recovery picture. It is particularly useful to have a man of his standing point out the inevitable bad results of overdoing union theories as exemplified in the rigidity of the wage structure in the building field and the consequent stagnation in that field.

At the same time some almost analogous situations have arisen in industry under NRA where code restrictions have been too rigid and the overdoing of what are good trade practices when not carried to extremes has caused trouble. It is human nature to think that if a little of anything is good more would be better but results do not always justify the belief. The economists have a law of diminishing returns that should be studied by every one who has anything to do with any phase of business. It shows the danger of overdoing.

Fire at Sea

TRADITION took a heavy toll in the Morro Castle disaster, as it always does where methods and materials of the past are relied upon to meet the exactions of the present. Wood was discarded long ago as a material for hulls and the major parts of superstructures. Tradition has kept it in favor for decks and furniture, and for the generally needless and often displeasing decoration of passenger saloons. With the present low costs of the light alloys and the molded plastics, and even of wood that has been treated to make it fire resistant, there is scant excuse for continuing the use of ordinary wood in passenger ship construction. The refinishing of the less modern of our passenger ships, with alloys and plastics substituted for wood, would make useful work for many of the unemployed in the metal trades.

.CHIPS.

Washington—Roosevelt confers with General Johnson and issues guarded statement on plans to make NRA a three-armed body, legislative, judicial and administrative . . . Arms inquiry drags in names of foreigners in high positions and brings vigorous protests to the State Department . . . Success of Cuban trade agreement encourages Secretary Hull to expedite others . . . Constitution Day serves as occasion for conservative orators to condemn Roosevelt program . . . Peek urges check on capital migration . . . A.F. of L. questions Congress candidates on 30-hour week, old-age and unemployment insurance, public works, and outlawing of company unions . . . Farm moratorium declared unconstitutional by Federal District Court judge at Baltimore.

Foreign—Germany sets up rigid control of all foreign trade . . . Russian gold output up nearly 50 per cent over last year . . . British Laborites demand munition inquiry . . . Poland threatens to kick over the traces on League control of minorities, is warned by Britain, France and Italy . . . Argentine loan conversion cuts interest charges 20 per cent . . . Disgruntled German Protestants riot in Nuremberg, arrests follow . . . Soviet accepts invitation to join League of Nations and takes seat . . . Swiss delegate protests admission claiming there can be no compromise between capitalism and the Marxist state . . . Mussolini will start training soldiers at 8, finish at 31.

Finance—Federal bank examiners are criticised for meticulous attitude and technical turn-downs on sound loans . . . Financial editor of London *Times* predicts record boom as British trade improves steadily . . . Treasury refunding of Fourth Liberty's has heavy going . . . Senate Committee finds branch banking system fundamentally weak as evidenced by Detroit and Cleveland failures . . . Washington loses hope of balanced budget for next year.

Industry—Lehigh Valley gets $3,000,000 PWA loan to be used in building 1,900 freight cars and in buying three diesel-electric switchers . . . Johnson accuses McMahon, textile strike leader, of bad faith, says strike is entirely unjustified . . . Houde decision unites manufacturers in fight for protection of minorities . . . Textile strike brings threat of appeal for U. S. troops from Rhode Island, and martial law in Georgia as militia adopts union's flying squadron tactics and captures pickets before acceptance of Winant Board report sends strikers back to jobs . . . Durable Goods Industries Committee adopts permanent set-up . . . National Manufacturers' Association forms committee of 43 headed by James W. Hook to study NRA and report the opinion of industry to the next Congress . . . American Railroad Institute, to succeed American Railway Association and Association of Railway Executives, is being formed.

Trade—Retail food prices up 7 per cent in year . . . Department store sales up 2 per cent . . . Shippers to unite in opposition to railroad demand for higher freight rates.

Indicators—Steel production improves moderately to above 20 per cent . . . Carloadings recover after holiday drop . . . Electric power production still below last year's levels . . . *Business Week's* index steady at 57.6.

Varied Program Prepared for Metal Congress

The National Metal Congress and Exposition, to be held in New York, October 1-5, promises to be the greatest of its kind since the 1929 meeting at Cleveland. Of the sponsors, the American Society for Metals, the Institute of Metals and the Iron and Steel divisions of the American Institute of Mining & Metallurgical Engineers, and the American Society of Mechanical Engineers will make their headquarters at the Hotel Pennsylvania; the American Welding Society and the Wire Association will have the Hotel New Yorker as their headquarters.

Exhibits will occupy a floor of the Port of New York Authority Building at Eighth Ave. and 15 St., with 150 firms showing their products. The doors will open 12 noon on October 1. More than ever the booths will feature actual operating displays.

While no definite schedule of plant trips has been arranged a number of manufacturers have offered to keep "open house" during the week and to supply guides for visitors. Among these are the U. S. Navy Yard, Brooklyn (open to citizens only); C. J. Tagliabue, Brooklyn; International Nickel Co., Research Laboratories, Bayonne, N. J. (Tuesday only); Eclipse Aviation Co., East Orange, N. J.; Wright Aeronautical Corporation, Paterson, N. J.; Singer Mfg. Co., Elizabethport, N. J.; International Motors Co., Plainfield, N. J.

Two sessions will be presented by the A.S.M.E. to be held on October 2 and 4. At the first of these a paper, "Non-Ferrous Metals, Today and Tomorrow," will be presented by Dr. Zay Jeffries, consulting metallurgist of the Aluminum Co. of America. At the second, a companion paper on "Iron and Steel, Today and Tomorrow," will be given by Robert S. Archer, metallurgist of the Republic Steel Corporation.

Thirty-seven papers will be presented before the A.S.M. in accordance with the following program:

Monday, October 1

10 a.m.—Hotel Pennsylvania Ball Room

HEAT-TREATING SESSION

Physical Properties of Case Hardened Steels, by O. W. McMullan, Timken Detroit Axle Co.

Heat Treatment in Controlled Atmospheres Including Gaseous Carburizing, by C. R. Austin.

Influence of Non-Metallic Inclusions Upon the Precipitation of Primary Cementite in Hypereutectoid Steels, by E. G. Mahin and E. F. Lee, University of Notre Dame.

2:00 p.m.—Port of Authority Bldg.

RESEARCH SESSION

A Graphical Method for Calculating Heat Loss Through Furnace Walls, by C. E. Weinland, Johns-Manville Research Laboratories.

Properties of Some Cast Alloy Steels, by T. N. Armstrong, Norfolk Navy Yard.

A Comparison of the Corrosion Resistance of Several Wrought Irons Made by Different Processes, by O. A. Knight and J. R. Benner, Pennsylvania State College.

Practical Observations of Some High Carbon, High Chromium Tool Steels, by W. H. Wills, Ludlum Steel Co.

Tuesday, October 2

10:00 a.m.—Hotel Pennsylvania, Ball Room

X-RAY SESSION

Grain Distortion in Metals During Heat Treatment, by C. Nusbaum, Case School of Applied Science, and N. P. Goss, Cold Metal Process Co.

X-Ray Exposure Charts for Steel, by H. R. Isenburger, St. John X-Ray Service, Inc.

New Development in Electrical Strip Steels Characterized by Fine Grained Structure Approaching the Properties of a Single Crystal, by N. P. Goss, Cold Metal Process Co.

Cutting Temperatures Developed by Single-Point Turning Tools, by O. W. Boston and W. W. Gilbert, University of Michigan.

2:00 p.m.—Port of Authority Bldg.

AGING SESSION

Prolonged Tempering at 100 Degrees Cent. and Aging at Room Temperature of 0.8 per cent Carbon Steel, by G. A. Ellinger and R. L. Sanford, National Bureau of Standards.

The Effect of High Hydrostatic Pressures on Aging, by L. R. Van Wert, Lecturer on Metallurgy, Harvard University.

Directional Properties in Rolled and Annealed Low Carbon Steel, by Arthur Phillips and H. H. Dunkle, Yale University.

Wednesday, October 3

10 a.m.—Hotel Pennsylvania, Ball Room

ANNUAL MEETING OF THE A.S.M.

Campbell Memorial Lecture, by Dr. V. N. Krivobok, Carnegie Institute of Technology.

2:00 p.m.—Port of Authority Bldg.

RESEARCH SESSION

Alloys of Iron and Manganese, Part XIII, by F. M. Walters, Jr. and Cyril Wells. Carnegie Institute of Technology.

The Influence of Oxide Films on the Wear of Steels, by S. J. Rosenberg and Louis Jordan, National Bureau of Standards.

The Metastability of Cementite, by H. A. Schwartz, National Malleable and Steel Castings Co.

Magnetic Properties of Iron as Affected by Carbon, Oxygen and Grain Size, by T. D. Yensen, Westinghouse Electric and Mfg. Co., and N. A. Ziegler, West Penn Electric Co.

Thursday, October 4

10:00 a.m.—Hotel Pennsylvania

RESEARCH SESSION

The Cobalt-Molybdenum System, by W. P. Sykes and Howard F. Graff, General Electric Co.

Malleable Castings, by Albert Sauveur and H. L. Anthony, Harvard University.

Oxidation of a Low Carbon Steel in the Temperature Range 1650 to 2100 Degrees Fahr., by C. A. Siebert, U. S. Rubber Co., and Clair Upthegrove, University of Michigan.

The Ductility of Chromium-Nickel Austenitic Steels of Elevated Temperatures, by H. D. Newell, Babcock and Wilcox Tube Co.

2:00 p.m.—Port of Authority Bldg.

STEEL MELTING SESSION

Studies of the Metallurgy of Arc-Deposited Weld Metal, by S. L. Hoyt, A. O. Smith Corp.

The Effect of Deoxidation on Some Properties of Steel, by C. H. Herty, Jr., Bethlehem Steel Co.

Non-Metallic Inclusions in Steel, by S. F. Urban, National Tube Co., and John Chipman, University of Michigan.

Friday, October 5

10:00 a.m.—Hotel Pennsylvania, Ball Room

GRAIN SIZE SYMPOSIUM

Grain Size in Metals With Special Reference to Grain Growth in Austenite, by M. A. Grossman, Illinois Steel Co.

General Relations Between Grain Size and Hardenability and the Normality of Steels, by E. S. Davenport and E. A. Bain, U. S. Steel Corp. Res. Labs.

Grain Size in Relation to Machinability and Other Properties of Bessemer Screw Steel, by H. W. Graham, Jones & Laughlin Steel Corp.

Grain Size Control of Open Hearth Carbon Steels, by S. Epstein, Battelle Memorial Institute, J. H. Nead, and T. S. Washburn, Inland Steel Co.

The PF Characteristic of Steel, by B. F. Shepherd, Ingersoll-Rand Co.

Effect of McQuaid-Ehn Grain Size on Hardness and Toughness of Automotive Steels, by H. W. McQuaid, Republic Steel Corp.

2:00 p.m.—Port of Authority Bldg.

GRAIN SIZE SYMPOSIUM (continued)

Effects of McQuaid-Ehn Grain Size and Fracture Appearance as Influenced by the Nature of the Steel, by Philip Schane, Jr., Carnegie Steel Co.

Effect of McQuaid-Ehn Grain Size of Steel in Forging, by W. E. Sanders, Buick Motor Car Co.

Influence of Grain Size on the High Temperature Characteristics of Ferrous and Non-Ferrous Alloys, by A. E. White and C. L. Clark, University of Michigan.

The Importance of Grain Size of Sheet Steel for Deep Drawing, by R. L. Kenyon, American Rolling Mill Co.

The Influence of Grain Size on Magnetic Properties, by W. E. Ruder, General Electric Co.

Factors Determining the Impact Resistance of Hardened Carbon Steels, by Howard Scott, Westinghouse Electric and Mfg. Co.

Of the A.I.M.E. papers of especial interest to metal-working shops are the following:

Wednesday, October 3

9:30 a.m.—Hotel Pennsylvania,

Roof Garden

(Institute of Metals)

DIE CASTING SESSION

Effect of Composition on Mechanical Properties and Corrosion Resistance of Aluminum Alloy Die Castings, by E. H. Dix, Jr., and J. J. Bowman.

Die Castings of Brass, by John R. Freeman, Jr.

Studies of Phase Changes During Aging of Zinc Alloy Die Castings and Their Technological Significance, by M. L. Fuller and R. L. Wilcox.

Rôle of the Spectrograph in Control of Die Casting Production, by T. A. Wright.

(Adjourning at 11 o'clock for Campbell Memorial Lecture)

9:30-11 a.m.—Hotel Pennsylvania,

Salle Moderne

(Iron & Steel Division)

RAW MATERIALS SESSION

Genesis and Development of Blast Furnaces from 6000 B.C., by Charles Hart.

Manufacture, Properties and Uses of Sponge Iron, by G. B. Waterhouse.

(Adjourning at 11 o'clock for Campbell Memorial Lecture)

2 p.m.—Port of Authority Bldg.

(Iron & Steel and Institute of Metals Divisions)

JOINT SESSION

Steels for Die Casting Dies, by Sam Tour.

Properties of Some Brass Die Casting Alloys, by O. B. Malin and W. W. Sieg.

Hot-Working Die Steels, by James P. Gill.

6:30 p.m.—Hotel Pennsylvania

(Iron & Steel and Institute of Metals (Divisions)

DINNER. Speaker, Sam Tour; subject, "Die Castings."

The program for the A.W.S. has been given in a previous number (*AM*—Vol. 78, page 572g).

Machine Tool Sales Increase in August

In face of discouraging reports of lessened activity in other industries, August machine tool orders rose 19.3 per cent over the preceding month. The index based on 1926 shipments, as compiled by the supervisory agency, was 41.4 as against 34.7 in July. Twenty-one per cent of the business originated abroad compared to 24 per cent for July indicating that the improvement was traceable mainly to domestic activity. However, there was some gain in export sales.

Distribution of orders in the industry was much improved; out of 203 companies, 108 or 53 per cent reported better business for August than July. In August, 50 of the 169 concerns reporting received orders amounting to better than 50 per cent of the 1926 average. In the preceding month only 39 of the 172 firms reporting showed this volume of business.

Table I—Index of Orders, Based on Volume of Shipments for 1926

Month	No. of Reports	Index of Orders			% Foreign to Total Orders
		Total	Domestic	Foreign	
January	163	53.7	43.9	9.8	18
February	163	50.9	40.5	10.4	20
March	163	48.1	40.1	8.0	17
April	163	46.5	36.2	10.3	22
May	160	45.9	35.4	10.5	23
June	166	35.3	27.4	7.9	22
July	172	34.7	26.3	8.4	24
August	169	41.4	32.4	9.0	21

Table II—By Size of Companies

Group A—Companies reporting year's sales in 1926 of $200,000 or more:

Months	No. of Reports	Index			% Foreign to Total
		Total	Domestic	Foreign	
January	82	54.0	43.5	10.5	19
February	82	50.7	39.5	11.2	22
March	82	47.2	38.8	8.4	18
April	89	46.2	35.3	10.9	24
May	88	45.8	34.6	11.2	25
June	90	35.1	26.8	8.3	24
July	90	34.7	25.8	8.9	26
August	93	41.0	31.4	9.6	23
Group B—Companies reporting year's sales in 1926 of less than $200,000:					
January	81	49.8	48.3	1.5	3
February	81	53.0	50.6	2.4	5
March	81	57.3	54.7	2.6	5
April	74	50.3	48.2	2.1	4
May	72	48.0	46.4	1.6	3
June	76	37.4	33.9	3.5	9
July	82	35.2	33.3	1.9	5
August	76	45.7	44.7	1.0	2

Table III—Indexes of Individual Companies

New Orders in % of 1926 Shipments	Number of Reports in Each Index Group							
	January	February	March	April	May	June	July	August
200 or more	7	4	4	6	4	2	3	6
100–199	14	16	17	15	12	10	9	8
90–99	8	4	5	4	4	0	2	5
80–89	7	5	6	3	5	8	3	7
70–79	4	4	7	2	6	5	2	3
60–69	5	6	12	5	11	10	12	9
50–59	5	13	6	19	12	7	8	12
40–49	20	14	9	19	10	9	13	14
30–39	14	14	19	17	22	24	22	18
20–29	22	20	27	20	22	23	29	23
10–19	27	25	23	22	33	21	26	27
Less than 10%	30	38	28	31	19	45	43	37
Total reports	163	163	163	163	160	166	172	169

Metal Congress Offers Tool Steel Course

A feature of the Metal Congress will be a course on tool steels to be given by James P. Gill, chief metallurgist, Vanadium Alloys Co. One lecture will be given at the Port of New York Authority Building each afternoon, October 1-4 inclusive. The last lecture to be held at the Hotel Pennsylvania on the morning of October 5.

Tool and Die Makers Discuss Activities

At its first meeting of the season on Tuesday, September 11, in the Hotel Pennsylvania, New York, the Hudson River Valley Division of the Special Tool, Die and Machine Shop Institute heard addresses by Roy T. Wise, managing director of the Institute, and Kenneth H. Condit, editor, *American Machinist*. President Frank Dole was in the chair.

Mr. Condit touched on industrial conditions existing prior to NIRA, traced the effect of NRA on these conditions, and outlined the opportunities of the trade association in the future. Mr. Wise recounted recent activities by the parent organization and answered questions put by members. The president reported that a paid secretary has been engaged and that his work for the Division would start at once.

Malcolm Muir Warns of New Deal Dangers

In a radio address under the auspices of the Merchants Association of New York, Malcolm Muir, president of the McGraw-Hill Publishing Co. and former NRA divisional administrator, pointed out some of the pitfalls in current political trends. The first of these is the policy of placing faith in labor leadership whose only purpose is to swell union membership, passing by the larger possibilities for all labor under the New Deal. A second danger is the setting up of relief bureaucracies that will be difficult to liquidate when the need for relief has passed. Government operation of manufacturing plants for the production of relief supplies was deplored in particular.

"In my opinion," said Mr. Muir, "there has been too great a change in emphasis on the part of the Administration from relief and rehabilitation to outright reform. I must admit frankly that the vision of reform that the President has spread before the country is inspiring to me. If he is establishing ultimate objectives to work toward over a reasonable period, giving the people and institutions of this country time to work it out slowly and adjust themselves gradually, there are many phases of the prospect that are pleasing. If, however, these reforms are to be rushed through regardless of their ill-effect upon business and, therefore, the immediate welfare of the American people, such haste must be opposed by every business man and all thinking citizens."

In closing Mr. Muir declared that the statement that business men are on strike and would scuttle the recovery program to defeat the New Deal is preposterous.

Linde Air Plans Another Clinic

Following its practice of holding clinics to disseminate information on oxy-acetylene welding and cutting the Linde Air Products Co. will organize another group to meet in New Orleans starting October 24. Previous clinics held this year were in Birmingham, Houston and Cleveland.

Business Ponders Policy Regarding New Deal Trends

WASHINGTON—With the removal of obstacles raised by the Comptroller General to the $2,300,000 Public Works allotment for Army arsenal modernization the metal-working industry at last sees prospects of a "cut" in the billions spent for governmental pump priming. The fly in the ointment which detracts from the promise of orders from this fund is the fear that "chiseling" tactics, condemned in private business but embraced by federal departments, may apply to the ordnance orders. Seemingly the Administration would like to use privately owned manufacturing facilities to create employment without compensating the owners for the use of their equipment. At any rate that is the practical outcome of demanding prices fifteen per cent below dealer discounts.

Business men in every industry are watching the Administration to see whether it will promote recovery by relieving the pressure on private business or whether a further swing to the left is in prospect. Some industrial leaders favor a showdown in the courts, an eventuality which the New Dealers so far have adroitly avoided. Critics have contended that the Administration has been stalling for time until new appointments could be made to the Supreme Court which would change the balance of power in that body.

The Houde case may serve as a basis for a definite judicial decision. Here the chief bone of contention is whether the majority group in a company can represent all the workers or, as previously ruled by Johnson, Richberg, and the President in his automobile strike settlement, whether each major group shall have proportional representation. The National Labor Relations Board reversed the previous policy and called upon the Houde Engineering Corporation to recognize the A. F. of L. union to act for all its employees. When the company refused to abide by this ruling the board called upon NRA to lift its insignia. General Johnson did this in his telegram of September 14, whereupon Houde refused to quit using the code Blue Eagle.

NRA's reorganization continues to be a puzzle. The three-armed control basis, with legislative, judicial and administrative branches has been announced, but business men want to know more. Details of organization are of far less importance to them than the extent of domination the revised NRA will exercise.

To crystalize policies of industrial leaders, the Durable Goods Committee, formed just after the Code Authorities Conference last March, reconvened and reorganized recently at Hot Springs, Va. The membership of the committee is practically unchanged with George H. Houston, of the Baldwin Locomotive Works as chairman and James W. Hook, of the Geometric Tool Co., as vice-chairman. No platform was formulated at the meeting, but subcommittees were appointed to study various problems affecting business.

Mr. Hook, in addition, heads the newly formed Association of Manufacturers Committee which consists of 43 representatives of various industries. This committee plans to have a definite program drawn up before the next Congress convenes.

Granting of numerous small loans characterized industrial loan operations during the first half of September. Managers of all the RFC regional agencies were called to Washington for conference. They were urged to co-operate with applicants in efforts to strengthen marginal cases so loans could be made, particularly when a high proportion of the advance goes into wages.

Despite reports to the contrary, no loans are being made for plant construction. Reports to that effect grew out of assurances to concerns with plants under construction that they could rely upon receiving working capital loans when their plants were complete. Some incidental use of funds for building repairs have been allowed when this has been an obvious necessity. Purchase of a few pieces of new equipment has been allowed in some instances when essential to the increased activity contemplated, but the policy is to hold such expenditures within five per cent of the total loan.

Except for the necessity of exposing the extent to which palm greasing enters business with foreign countries the Senate's arms investigation has accomplished little as yet. Meanwhile cancelled contracts resulting from the hearings already have separated several thousand American workmen from payrolls. The number promises to grow progressively greater and to divert profitable business permanently to countries that do not indulge in much legislative fishing.

• INDUSTRIAL REVIEW •

• Hope deferred is about the only consolation left the machinery and machine tool industries as the expected autumn upturn fails to put in an appearance. Purchasers are maintaining the policy of watchful waiting, popularized by the last Democratic President and enforced by the uncertainties surrounding the program of the present one. As a result orders are held at a minimum dictated by dire necessity and the machinery industry is thus prevented from taking its place as a re-employing factor in American industry. Release by the Controller-General of the $2,300,000 PWA appropriation for Ordnance machine tool replacements is the most important recent news.

• Business is pretty generally at a standstill in the Eastern territory. Distributors are counting on a share of the Ordnance appropriation because of the manufacturing arsenals in that section. Some of them are a bit apprehensive of the jam that may ensue if all potential customers demand deliveries at once. September will probably show slightly better business in Pittsburgh than August did and there is some hope for an appreciable gain in October and November but machine tool sales will probably be low. In Cleveland, during the past month, employment in the metal-working shops has been declining. There is reason to believe that it will improve shortly and that there may be some machine tool business in October and November. Inquiries are a little better.

• Detroit distributors have secured some orders but the far greater number that have been held up at the last minute is rather disheartening. One correspondent expresses the hope that when the yacht races and the baseball season are over business men will get back to work. Inquiries have been much more frequent in Cincinnati but few of them have become orders. Even the scattering ones have been welcome, however. Nothing of moment has happened to change the picture in Indianapolis. It has not been very bright but the industry there is looking forward to a fair fourth quarter.

• St. Louis feels that the outlook for the remainder of the year is brighter although the effects of the summer slump are still visible. Chicago isn't as cheerful as it was a fortnight ago but is hopeful that the Administration will clear the air for business before long. In Milwaukee business is very quiet and several strikes are still unsettled. No appreciable pick up has occurred as yet.

Cincinnati Milling Machine Celebrates 50th Anniversary

During the week of October 8-13 the Cincinnati Milling Machine Co. will celebrate its founding in the year 1884. At the open house held during this period for the friends and customers of the concern a complete historical development of its products and the latest designs will be shown. Industrial executives, works managers, superintendents, and foremen are coming to Cincinnati for this occasion from all parts of the United States and Europe.

Visitors attending the celebration will have an opportunity to see the Cincinnati Hydro-Diematic, a new automatic profile and die-sinking machine, a complete line of broaching machines including horizontal, duplex and rotary types, for broaching parts at an unusually high rate of production, the new line of high speed dial type machines for high speed milling, and the new Cincinnati centerless lapping machine for precision finishing of a variety of parts, such as piston pins and steel bars and other cylindrical parts.

The exhibition room, containing standard milling, centertype, and centerless grinding machines, will be of particular interest as each machine will be under power and attended by an expert demonstrator to show the visitor its operating features. A special exhibit of precision measuring and testing instruments will be open for inspection, including a display of new precision gages for both external and internal measurements.

Of special interest to the small parts manufacturer will be the new No. 1-12 plain automatic milling machine which was designed especially for milling small parts, such as typewriter and business machine parts. One of the largest centerless machines ever built, a 16x144 in. plain grinding machine and a hydromatic milling machine tooled up for high production will all be in operation.

Auto Makers Accelerate Tooling Programs

DETROIT—Production of automobiles increased by about 5,000 units the week ending September 15 over the previous week which included Labor Day shutdowns. August car and truck production are placed at 240,000 with members of the Automobile Manufacturers Association (old N.A.C.C.) turning out 167,407 of this total. This represents a decrease of fourteen per cent under July and, for the A.M.A. membership, three per cent under August of last year.

Production for September is uncertain; estimates run up from 150,000 units to 180,000 which would make it the first month since January that the total has dropped below 200,000. Output the first eight months of this year exceeds the 1933 figures by 43 per cent and 10 per cent over the output for the entire year of 1933 for members of the A.M.A.

Polk's estimate of August sales of cars and trucks in this country totals 236,000, showing that, since production figures are world figures, the two are running together closely.

Retail sales in September are maintaining a fairly even trend. The week ending September 1 the Chrysler Corporation retail deliveries were 14,820 units, a record week. Buick reports a sharp upturn in sales the first ten days of September when 1,780 new cars were delivered compared with 1,388 the last ten days of August. Others report strength in early September. It is unlikely that firming of sales in early September are likely to result in production boosts because of the desire to work down inventories of completed cars.

The outstanding item in labor relations is the announcement of the National Labor Relations Board ruling in the Houde Engineering Corporation case. In substance it is that management, in the parts industry, must deal with the majority as representatives of all employees in collective bargaining. This is in sharp distinction to the President's settlement in the automobile assembly industry where maintenance of proportional representation is a mandate. This conflict in policy is pregnant with future difficulty.

Although Packard and Auburn are the only companies showing their hand with 1935 models, preparation is going on apace with the customary rumors as to new cars and radical changes. The truth is that many makers themselves do not know what will be done at present. The Packard announcement of a light car some time ago is likely indicative of the sentiment of high priced car makers toward the medium priced market. The four-cylinder Continental is far from being eliminated from the 1935 picture. The safety chassis, embodying the Leaf Spring Institute's plan for both front and rear wheel suspension by means of transverse leaf springs as contrasted with coil springs, is a factor which cannot be evaluated at present. General Motors, as reported in a previous number, denies that knee action will be abandoned.

New tools are now being let with estimates in some quarters that the amount will run six times that of the third quarter. Sheet-metal machinery is enjoying a good play because of attention to streamlining while other productive equipment is meeting resistance in considerable amounts of liquidation machinery floating around. Parts makers in many cases find little encouragement toward expansion because of unsatisfactory profit margin on 1934 business. Increased costs under codes, labor difficulties and six months contracts with car makers at fixed prices are responsible.

More tool work will be let outside the Detroit area than in 1929, but less than last year is the anticipation. That some should go out is only natural to expect since outsiders came to the rescue of car makers last fall. However, 85 per cent of Keller machine capacity is in this area as is greater familiarity with automotive precision needs.

Evidence shows increased dissatisfaction with the operation of the retail code; the expiration of the assembly code in November and the Houde case are disturbing influences in the industry at present, although the National Labor Board stated on September 14 that the Wolman Board would not be disturbed in its work with the assembly industry.

Ford announces a 10-hp. car for the English market to sell for $675 which is $50 under the price of the Morris and Austin.

Foundry Equipment Orders Off in August

Not only were foundry equipment orders during August below the July figure, but they showed a still greater drop from the level reached in August, 1933. The index of gross orders as compiled by Foundry Equipment Manufacturers Association was 43.1 as compared to 50.7 in the preceding month and 56.3 for August of last year. Shipments were also off at 48.7, which contrasted with 67.2 for July and 49.7 in August, 1933.

In one respect, however, the industry is slightly better off than it was last year at this time. Unfilled orders with an index of 36.3 are above the figure of 35.3 a year ago although they are sharply off from the 43.1 level of last month. The three months average of gross orders is now at 54.7 as compared to 62.5 in July, 50.2 in August of last year. Twenty-one members contributed to this report.

N. E. Council Poll Shows Lack of Confidence

In answer to a letter from Henry D. Sharpe, president of Brown & Sharpe and of the New England Council, addressed to Council members, 94 per cent of the replies expressed a lack of confidence in business in general and 78 per cent a lack of confidence in relation to their own business. The letters were sent to 1,530 managers of a wide range of industries and the poll represents the response of 501 of these.

Causes of lack of confidence were given as follows:

1. Uncertainty regarding Administrative policy toward business.
2. Government interference with and control of business.
3. Excessive expenditures, borrowings, unbalanced budget.
4. Uncertainty regarding monetary policy; fear of inflation.
5. Experiments and reforms.
6. Distrust of President's advisers.

A. S. T. M. Committees Add New Officers

A number of new officers have been chosen as a result of the elections of standing committees of the American Society for Testing Materials. The names of the men elected to committees in the metal groups are given below:

Committee A-3 on Cast Iron

Vice-chairman—W. H. Rother, metallurgist, Buffalo Foundry & Machine Co.

Secretary—E. K. Smith, metallurgist, Electro Metallurgical Co.

Committee A-5 on Corrosion of Iron & Steel

Chairman—F. F. Farnsworth, outside plant engineering, Bell Telephone Laboratories.

Committee A-9 on Ferro-Alloys

Chairman—Charles McKnight, The International Nickel Co.

Vice-chairman—W. R. Shimer, metallurgical engineer, Bethlehem Steel Co.

Secretary—J. J. Crowe, engineer in charge, apparatus and development department, Air Reduction Sales Co.

Committee B-1 on Copper Wire

Secretary—J. H. Foote, supervising engineer, Commonwealth & Southern Corporation.

Committee B-2 on Non-Ferrous Metals and Alloys

Vice-chairman—E. H. Bunce, and W. G. Schneider.

Committee B-6 on Die-Cast Metals and Alloys

Chairman—J. R. Townsend, general development laboratory, Bell Telephone Laboratories.

Vice-chairman—W. H. Graves, chief metallurgist, Aluminum Co. of America.

Committee B-7 on Light Metals and Alloys, Cast and Wrought

Chairman—Sam Tour, vice-president, Lucius Pitkin, Inc.

Metal-Working Code Hearings Scheduled

Date	Place	Deputy Administrator	Association
Sept. 26	Willard Hotel	B. S. King	Hydraulic Institute
Oct. 3	Willard Hotel	W. A. Janssen	Council of Forgings Division of the Aluminum Industry
Oct. 3	Willard Hotel	W. A. Janssen	Council of the Piston Castings. Division of the Aluminum Industry
Oct. 4	Commerce Bldg.	D. A. Tutein	National Electrical Manufacturers Association (Electric Tool Division)
Oct. 5	Hamilton Hotel	H. F. White	Cutlery, Manicure Implement & Painters & Paperhangers Tool Manufacturers

Industrial Material Makers To Exhibit Wares

Twenty-two manufacturers will display their products at the second annual Industrial Materials Exhibit to be held at the Park Central Hotel, October 15-18. The program will include daily film showings, lectures and special demonstrations.

Included in the motion pictures to be shown are: *Jewels of Industry*—Carborundum Co.; *The Making and Rolling of Steel*—P. A. Frasse & Co.; *The Making and Processing of Seamless Steel Tubing*—P. A. Frasse & Co. Lectures will be given on "The Future Possibilities of Bakelite"—Bakelite Corporation and "The Manufacture and Uses of Felt"—American Felt Co.

Canada Uses More U. S. Machinery

Recent months have seen a substantial gain in demand by Canada for industrial machinery made in the United States. The mining branch has been particularly active with gold companies the chief buyers, but other industries, notably the textile, automotive, metalworking and printing, have been active in installing new equipment. Deferred replacement needs make the prospects good for continuation of this demand during the fall and winter, according to the Department of Commerce.

During the 12-month period ended June, 1934, Canada imported machinery valued at $15,985,518, of which $11,797,750 originated in the United States and $2,394,929 in the United Kingdom. The respective totals for the preceding fiscal period were $11,588,541, $9,326,753 and $1,688,458. The largest single item in Canadian machinery imports is textile machinery, of which shipments valued at $2,613,674 came from the United States in the 1933-34 period, an increase of 86 per cent over the preceding fiscal year's total.

It is apparent that despite higher production costs in the United States, with resultant price increases, American machinery exporters are regaining their place in the Canadian market as a result of the superior quality of their products, proximity to buyers and ease of servicing.

Three Administration Members Named for Code Authorities

According to a recent announcement the following were appointed as government representatives to divisional code authorities:

Open Steel Flooring Manufacturing Industry (division of FMPF)—Samuel E. Duff, consulting engineer.

Pulp and Paper Machinery Industry (division of MAPI)—F. A. Davison, formerly in building specialty manufacture.

Beater and Jordan and Allied Equipment Industry (division of MAPI)—E. G. Vail, former president of the Gurney Refrigerator Co.

• MEETINGS •

American Society of Mechanical Engineers Fall meeting of Iron and Steel Divisions in conjunction with National Metal Congress, Oct. 1-5. Hotel Pennsylvania, New York, N. Y. P. T. Wetter, assistant secretary, 29 W. 39th St., New York, N. Y.

American Society for Metals. Annual meeting, Oct. 1-5. Hotel Pennsylvania, N. Y. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

American Welding Society. Annual meeting, Oct. 1-5. Hotel New Yorker,

New York City. Miss M. M. Kelly Secretary, 29 West 39th Street, New York, N. Y.

INDUSTRIAL MATERIALS EXHIBIT. Second annual exhibition, Oct. 15-19. Park Central Hotel, New York, N. Y.

INTERNATIONAL ACETYLENE ASSOCIATION. Annual meeting, Nov. 14-16. William Penn Hotel, Pittsburgh, Pa. H. F. REINHARD, secretary, 30 East 42nd St., New York, N. Y.

NATIONAL METAL CONGRESS. Exhibition and program sponsored by the A.S.M., the A.W.S., the Institute of Metals and Iron & Steel Divisions of American Institute of Mining and Metallurgical Engineers and the Wire Association, October 1-5. W. H. Eisenman, director, 7016 Euclid Ave., Cleveland, Ohio.

NATIONAL SAFETY COUNCIL. Twenty-third annual safety congress and exposition. Oct. 1-5. Hotel Statler, Cleveland, Ohio. National Safety Council, Inc., 20 North Wacker Drive, Chicago, Ill.

REFRIGERATING MACHINERY ASSOCIATION. Annual meeting, Oct. 22. Stevens Hotel, Chicago, Ill. Address of association, 915 Southern Bldg., Washington, D. C.

SOCIETY OF AUTOMOTIVE ENGINEERS. National production meeting, Oct. 11-12. Book-Cadillac Hotel, Detroit. John A. C. Warner, manager, 29 West 39th St., New York, N. Y.

• PERSONALS •

ALEXANDER C. BROWN has resigned as president of the Industrial Brownhoist Corp., Bay City, Mich., to join the Cleveland-Cliffs Iron Co., Cleveland, as first vice-president. MELVIN E. PATTISON has been elected president and treasurer to succeed Mr. Brown. He had been executive vice-president and secretary. GEORGE A. LONG, formerly plant manager, has been made vice-president in charge of manufacturing.

ARTHUR J. BRANDT has been appointed assistant general manager of the Hupp Motor Car Corp., Detroit.

D. C. SELHEIMER, factory manager of the Massey-Harris Co., Racine, Wis., has been made general manager to succeed LINDSAY M. DONALDSON, who resigned Sept. 15. Before joining the Massey-Harris Co., Mr. Selheimer was connected with Advance-Rumley.

E. W. STEWART, engineer, the Wm. D. Gibson Co., Chicago, spring maker, will speak before the Chicago chapter, American Society for Metals, on Oct. 11, at the Medinah Club. He will talk about the recent advancements in design and application of springs.

H. A. HOUSTON has been made assistant to the general manager, United Engineering & Foundry Co., Pittsburgh, Pa. Mr. Houston joined the company in 1933. At one time he was manager of mechanical parts, railway equipment engineering department, of the old Westinghouse Electric & Machine Co., and also works manager of the R. D. Nuttall plant.

MAX RACHWALSKY, formerly of George Stenzel & Co., Berlin, but now representing E. H. Jones & Co., London, arrived in New York on Sept. 11 on a business trip.

• BUSINESS ITEMS •

The Carboloy Company, Inc., has moved its general offices and main manufacturing plant to larger quarters at 2985 East Jefferson Ave., Detroit. Particular attention has been given to facilities for producing special types of Carboloy tools.

The Ex-Cell-O Aircraft & Tool Corp., Detroit, has transferred O. J. HUNTLEY, precision boring demonstrator, to the sales staff located in the Dayton territory. He will handle the complete line of Ex-Cell-O products.

Henry Disston & Sons, Inc., Philadelphia, Pa., has appointed the Manufacturers Supply Co., 3528 East 76th St., Cleveland, as distributor for its industrial products.

The Marlin-Rockwell Corp., Jamestown, N. Y., has opened a factory branch at 550 Polk St., San Francisco, Calif. JAMES ROSS BROWN is branch manager.

• PATENTS •

August 21, 1934

Metal-Working Machinery

Grinding Machine. Harold L. Blood, Worcester, Mass., assigned to the Heald Machine Co. Patent 1,970,645.

Machine. John F. Fischer, Lansing, Mich., assigned to Detroit Moulding Corp. Patent 1,970,694.

Planer. August Marx Cincinnati, and Howard W. Hunt, Norwood, Ohio, assigned to the G. A. Gray Co. Patent 1,970,810.

Compensating Means for Cam Milling Machines. John C. Shaw and Robert D. Shaw, Hartford, Conn., assigned to Pratt & Whitney Co. Patent 1,971,121.

Grinding Machine. Waldo J. Guild, Worcester, Mass., assigned to the Heald Machine Co. Patent 1,971,138.

Machine Tool Head. John R. Johnson, Rockford, Ill., assigned to the Ingersoll Milling Machine Co. Patent 1,971,157.

Seam Welding Apparatus. Preston M. Hall, Worcester, Mass., assigned to Federal Machine & Welder Co. Patent 1,971,217.

Tool Head Unit. Ernest L. Fickett, William O. Forman and Roland G. Holmes, Fitchburg, Mass., assigned to Fitchburg Engineering Corp. Patent 1,971,299.

Tools and Attachments

Flanging Press Delivery Device. Andre Bremont, Paris, France, assigned to Societe des Agrafes Francaises (Societe Anonyme), Paris, France. Patent 1,970,882.

Magnetic Chuck. Frank L. Simmons, Woonsocket, R. I., assigned to the Taft-Peirce Manufacturing Co. Patent 1,970,922.

Vise for Shapers. Robert Heinrich, Racine Wis. Patent 1,971,069.

August 28, 1934

Metal-Working Machinery

Hydraulic Control and Operating Mechanism for Machine Tools. Robert S. Condon, Rochester N. Y., assigned to Gleason Works. Patent 1,971,598.

Metal Forming Machine. Albert Rafter, Glen Ridge N. J. assigned to Rafter Machine Co. Patent 1,971,696.

Wheel Press. William James Johnston, London, Ontario, Canada, assigned to Norman V. Schooley and to Albert Speare Lashbrook. Patent 1,971,821.

Welding Apparatus. Pearce Klein, Schenectady, N. Y., assigned to General Electric Co. Patent 1,971,822.

Adjustable Mounting for Dressing Devices for Grinding Wheels. Harold L. Blood, Worcester, Mass., assigned to the Heald Machine Co. Patent 1,971,848.

Power Press. Karl Keck, Goppingen, Germany, assigned to L. Schuler Aktiengesellschaft, Goppingen, Germany. Patent 1,971,937.

William G. Hoelscher, Norwood, Ohio, assigned to the American Tool Works Co. Patent 1,971,956.

Tools and Attachments

Chuck. Harry E. Sloan, Hartford, and George A. Highberg, West Hartford, Conn., assigned to the Cushman Chuck Co. Patent 1,971,537.

Die Cleaning Device for Electric Welding Machines. Francis H. Speed, Lynn, Mass., assigned to Thomson-Gibb Electric Welding Co. Patent 1,971,538.

Motor Operated Chuck for Lathes and Other Machine Tools. Wilhelm Berg, Bielefeld, Germany. Patent 1,971,638.

September 4, 1934

Metal-Working Machinery

Grinding Machine. William C. Osterholm, Oak Park, Ill. Patent 1,972,160.

Swinging Frame Grinding Machine. Howard W. Dunbar and Joseph R. Whittles, Worcester, Mass., assigned to Norton Co. Patent 1,972,217.

Feed Mechanism for Tool-Carrying Spindles. Charles F. Schenck, Toledo, Ohio, assigned to the Toledo General Mfg. Co. Patent 1,972,359.

Clutch Mechanism for Lathe Aprons. Constant Bouillon, Torrington, Conn., assigned to the Hendey Machine Co. Patent 1,972,373.

Automatic Cut-Off Machine. William L. Libby, Cleveland, Ohio, assigned to John G. Oliver. Patent 1,972,595.

Grinding Machine. Robert E. W. Harrison, Cincinnati, Ohio and Samuel Carbis, Tarentum, Pa., assigned to Cincinnati Grinders Incorporated. Patent 1,972,623.

Milling Machine. Walter F. Smith, Providence, R. I., assigned to Brown & Sharpe Mfg. Co. Patent 1,972,633.

Broaching Machine. William J. Fiegel, Winfield S. Enderich, and Leo Bracciano, Detroit, Mich., assigned to Bohn Aluminum & Brass Corp. Patent 1,972,769.

Milling Machine. Millard Romaine, Cincinnati, and Erwin G. Roehm, Norwood, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,972,818.

Gear Cutting Machine. Walter D. Archea, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,972,823.

Grinding Machine. Frederick S. Haas, Cincinnati, Ohio, assigned to Cincinnati Grinders, Incorporated. Patent 1,972,826.

Milling Machine Structure. Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,972,827.

Milling Machine. Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,972,828.

Tools and Attachments

Indicating Limit Plug Gauge. Erik H. Aldeborgh and Alfred H. Emery, Poughkeepsie, N. Y., assigned to the Standard Gage Co., Inc. Patent 1,972,124.

Metal-Working Machinery

Machine for Cutting Spiral Bevel Gears. Frank H. Adams, Cleveland Heights, Ohio. Patent 1,973,133.

Cutter for and Method of Forming Spiral Bevel Gears. Frank H. Adams, Cleveland Heights, Ohio, assigned to the Cleveland Hobbing Machine Co. Patents 1,973,134-1,973,135.

Hydraulic Machine Tool. Everette K. Morgan, Rockford, Ill., assigned to the Ingersoll Milling Machine Co. Patent 1,973,150.

Grinding Machine. Bert E. Rockhoff, Detroit, Mich., assigned to Detroit Steel Products Co. Patent 1,973,177.

Thread Rolling Apparatus. Charles Fassinger, Pittsburgh, Pa. Patent 1,973,201.

Metal Working Machine. Robert S. Brown, New Britain, Conn., assigned to the New Britain-Gridley Machine Co. Patent 1,973,368.

Actuating Mechanism for Profile Grinders. Charles H. A. F. L. Ross, Washington, D. C. Patent 1,973,507.

Profile Grinder. Charles L. Ross, Washington, D. C. Patent 1,973,508.

Method of Grinding. Charles H. Schmals, Ridley Park, Pa. Patent 1,973,511.

Grinding Machine. Robert E. W. Harrison and Kennon T. Schledorn, Cincinnati, Ohio, assigned to the Heald Machine Co. Patent 1,973,626.

American Machinist — REFERENCE BOOK SHEET ©

Uses of S.A.E. Brass and Bronze Alloys

A survey of motor vehicle and parts manufacturers in 1932-33 indicated that S.A.E. brass and bronze specifications are used in parts and types of service such as those listed below:

No. 40. Red Brass—Water-pump impellers, fittings for gasoline and oil lines, small bushings, small miscellaneous castings.

No. 41. Yellow Brass—Radiator parts, fittings for water-cooling systems, battery terminals, miscellaneous castings.

No. 42. White Nickel Brass—Control brackets, levers to match nickel-silver trimmings and fittings on motorboats.

No. 43. Manganese Bronze—Gear-shifter forks, counters, spiders, brackets and similar fittings, parts for starting motors, landing-gear and tail-skid castings for airplanes.

No. 44. Brass To Be Brazed—Fittings for water-pipes which are brazed.

No. 45. Brazing Solder—For brazing.

No. 62. Hard Bronze—Gears, bearings, bushings for severe service, valve guides, valve-tappet guides, camshaft bearings, fuel pump, timer and distributor parts, connecting-rod bushings, piston pins, rocker lever, steering sector and hinge bushings, starting-motor parts.

No. 63. Leaded Gun Metal—Bushings and bearings, fittings for moderately high water or oil pressures.

No. 64. Phosphor Bronze—Wrist pins, piston pins, valve rocker-arm bushings, fuel and water-pump bushings, steering-knuckle bushings, aircraft control bushings, resistance to wear and scuffing.

No. 640. Nickel Phosphor Bronze—Cones of synchronizer gears.

No. 65. Phosphor Gear Bronze.—Not regularly used.

No. 66. Bronze Backing for Lined Bearings—Main bearings, connecting-rod bearings.

No. 67. Semi-Plastic Bronze — Water-pump bearings.

No. 68. Aluminum Bronze—Valve seats, worm wheels, gears, valve guides and forgings.

No. 70. Commercial Brass Sheets—General purposes, gasoline tanks, oil tanks; radiator shells, trim rods, pipe, rivets, water-jacket plates, flat springs, deep drawings and stampings.

CLASSIFICATION OF COPPER BASE ALLOYS

Alloys	General Composition, Per Cent				General Characteristics	General Uses
	Copper	Zinc	Lead	Tin		
Commercial Bronze 95 Per Cent	95.0	5.0	.	..	Copper colored, pliable	Primer cups, bullet jackets, jewelry
Commercial Bronze 90 Per Cent	90.0	10.0	..	..	Resists corrosion and atmospheric action	Automobile radiators, screens, radios
Red Brass 85 Per Cent	85.0	15.0	..	..	Resists corrosion and atmospheric action	Tubing, hardware
Red Brass 80 Per Cent	80.0	20.0	.	..	Resists sea water and atmospheric corrosion	
Brazing Brass	75.0	25.0	..	..	.....	Parts to be brazed or silver soldered
Spring Brass	72.0	28.0	..	..	Withstands drastic treatment	Springs, rods, etc.
Cartridge Brass Grade A Comm.	70.0	30.0	..	..	.....	Seamless tubes, deep drawings
Eyelet Brass Grade B Comm.	68.0	32.0	..	..	. ...	Eyelets, drawn shells
Drawing or Spinning Brass	66.67	33.33	..	..	.....	Deep drawings
Commercial Brass Grade C	65.0	35.0	..	..	Not good for weather exposure unless annealed	Fixtures, radiators, ornaments
Brass Wire	63.0	37.0	..	..	.....	Rivets, pins, screws, heading operations
Munts Metal	60.0	40.0	..	..	Worked hot, finished by slightly cold working	Bolts, nuts, sheathing, wire
Leaded-Low Brass	78.5	20.0	1.5	..	Free cutting	Rivets, similar articles
Turning Rod	62.0	35.0	3.0	..	Machines easily	Automatic machine work
Clock Brass	61.5	37.0	1.5	..	Free milling	Meter and clock parts, gears
Admiralty Metal	70.0	29.0	..	1.0	Resistant to sea water	Condenser tubes, ferrules
Tobin Bronze or Naval Brass	60.0	39.25	.	0.75	Stronger than commercial brass rod. Resistant to sea water	Rods, bolts, nuts, piston rods, propeller shafts, plates
Everdur,[1] Cast	94.4	..	..	..	Has corrosion resisting properties of copper and physical properties of mild steel	Cold or hot rolled, forged
Everdur,[2] Wrought	96.0	..	..	..		

[1] Patented 1925; contains 4.5 per cent of silicon and 1.0 per cent of manganese.
[2] Patented 1925; contains 3.0 per cent of silicon and 1.0 per cent of manganese.

These alloys are usually furnished in the following tempers and anneals:

Tempers	Reduction, B. & S. Gage
Quarter Hard	1
Half Hard	2
Hard	4
Extra Hard	6
Spring	8
Anneals	
Light	
Drawing	
Soft Drawing	

No. 71. Copper Sheets — Minor parts such as connectors and terminals, cover plates, radiators, fittings on wing beams and struts.

No. 72. Free Cutting Brass Rods—Small screw-machine parts, pins, nuts, plugs, screws, valve disks, valve caps.

No. 73. Naval Brass or Tobin Bronze Rods — Forgings, water-pump shafts, gears, gear bearings, propeller shafts, studs and nuts, bushings, turnbuckle barrels, adjusting strut-ends, valve-stem bushings, screw-machine parts.

No. 74. Annealed Seamless Brass Tubing—Brass water-pipe, ignition tubes, foot-rest bars, radiator attachments and spacers, heaters, lighting plants.

No. 7. Copper Tubing—Oil and fuel lines, oil-gage tube in lighting plants.

No. 76. Naval Brass or Tobin Bronze Tubing—Bushings and bearings for starting motors and lighting plants.

No. 77. Phosphor Bronze Strips (Grade A)—Friction plates in clutches, thrust washers, small springs, contact springs. (Grade B) Contact supports and springs, starting-switch springs.

No. 79. Red Brass Sheets—Radiators; lamp shells, special drawing purposes.

No. 80. Brass Wire—General purposes for springs, also for wrapping turn-buckles and locking wire.

No. 81. Phosphor Bronze Wire—Minor springs.

No. 82. Brass Wire—Safety wire for fastening nuts and bolts. See also S.A.E. No. 80.

No. 83. Soft or Annealed Copper Wire—Electrical purposes, wire and cable.

No. 88. Brass Rods — Forgings, screws and studs.

The data on this page are taken from the "Supplement to 1933 S. A. E. Handbook," issued August, 1934, by the Society of Automotive Engineers, New York.

Machine Expansion Program For the Second Five-Year Plan

A. M. WASBAUER

From Moscow the author sends another current report on industrial progress in the Soviet Union

THE STALIN automotive plant in Moscow (formerly Amo) is to be enlarged to three times its present capacity. By the end of 1935, it will add 1907 new machine tools to the present equipment. This will consist of 105 engine lathes, 83 multiple tool lathes, 103 turret lathes, 120 semi-automatic lathes, 87 auto-screw machines, 438 boring and drilling machines, 239 milling machines, 137 gear cutting machines, 224 grinders of all types, 373 special machines. A large percentage of this equipment will be bought abroad.

There are now 1637 machine tools in the Stalin machine shops, but by 1941, it is planned to have 5987 machine tools in the greatly enlarged shop; 2272 of these are to be imported and the rest, 3715, are to be built here. It is foreseen that the imports of equipment for this plant alone will cost $6,490,000, and the Russian built equipment will cost 2,563,000 rubles.

One set of spare parts will be bought for every eleven machines of a given type and model.

With this increase in equipment, the Stalin plant in 1935 is to build 40,000 trucks of three to four tons capacity, and 160 new model Buicks.

In 1936—64,000 trucks and 7,300 Buicks.

In 1937—90,000 trucks and 11,100 Buicks or their equivalent.

In 1938—95,000 trucks and 12,260 Buicks or their equivalent.

In 1939—99,000 trucks and 13,600 passenger cars.

In 1940—103,000 trucks and 14,400 passenger cars.

In 1941—106,000 trucks and 14,400 passenger cars.

The machine tool industry will play a big part in the ambitious expansion program of the automotive industry. The plan on the output of machine tools for the second Peatiletka, based on the Order of Narkomtyashprom 557 is as shown tabulated at the right.

The Kramatorsk heavy machine plant is going to be the pride of the U.S.S.R. The thirteen shops, comprising the first section now completed, cover 300 acres of the 400 acres which will be occupied when the entire plant is complete. It will then produce half of all the equipment required by the Soviet metallurgical industry. Twenty-four thousand tons of structural steel and 150 acres of window glass entered into the construction of the first section.

Output of Machine Tools

Plant	Type of Machine	1934	1935	1936	1937
Machines to be built by present factories of the machine tool trust					
Krasni Proletary, Moscow.	Heald internal grinders German V.D.F. type lathes Sundstrand stub lathes Lorenz gear shapers	2,390	2,700	3,000	3,500
Samototshka, Moscow	Shapers, slotters	800	1,200	2,000	3,000
Komsomolets plant-school, Yegoryevsk	Gear hobbing machines and others	325	500	800	1,200
Lenin plant, Odessa	Drill presses	1,695	2,600	3,500	4,000
Sverdlov plant, Leningrad	Boring mills and planers	310	400	500	700
Plant in Samara		537	600	800	1,200
Turret-lathes plant, Moscow	"Warner Swasy" type lathe, and other auto lathes	920	1,500	2,500	3,700
Milling machines plant, Gorky	Milling machines	965	1,900	3,400	4,500
Tool-plants		800	1,200	1,500	2,000
Among eleven new plants now in construction or projected		120	1,000	3,500	6,900
In other plants not under control of machine tool trust					
Communard, Lubny, Ukraine		250	350	450	550
Communard, Minsk, White-Russia		125	925	2,075	2,020
Proletari, Gomel, White-Russia		20	110	250	300
Krasny metallist		3,250	3,010	2,250	1,650
Plant of the Central Labor Institute		450	550	1,200	2,000
GUOMZ		125	245	320	350
AKNI		360	380	400	400
Krasny putie, Kasan, Volga		100	170	300	400
Record, Armenie		50	120	140	150
Aviatechnik, Taganrog, Asov sea		100	190	160	180
Aviatechnik, Voronesh		.....	20	25	30
Ural plant of heavy machinery Sverdlovsk		10	30	60	100
Kramatorsk plant of heavy machinery, Kramatorsk, Donbas		10	25	60	100
Grand Total		13,712	19,725	29,190	38,930

When both sections are complete the plant will produce annually 173,000 tons of iron and steel castings—by far the largest foundry in the world.

It will be equipped with 1200 heavy machine tools of which nearly 700 have already been installed. Among these are seven forging presses varying from 1,000 to 15,000 tons capacity, the latter being capable of turning out 300 tons forgings.

Special attention is devoted this year to transport. Transport is still a weak spot in the national economy of the U.S.S.R. It acts as a brake upon the rapid construction of new plants in a number of districts; it delays trading between town and countryside. The expenditure on the extension and reconstruction of transport this year attained unexampled magnitude; 3,365,000,000 rubles for the development of railways and a little less than 1,000,000,000 rubles for water transport.

The best way to get an idea of what these figures mean in expenditure of labor and material is to consider the average wage rate for industrial workers, which is around 175 rubles a month, and modify this with a factor of productivity compared with America varying from equality to one-sixth.

Ten Points of the Plan

The following was culled from the order of the commissariat of heavy industry, No. 141, pertaining to the project of development of the machine tool industry during the second Five-Year Plan.

In order to supply the requirements of the national economy in the automotive, aviation and railroad industries, for domestic machine tools and metallurgical equipment during the second Five-Year Plan, the following is decreed:

1. That further study of the requirements for machine tools to be used in the second Piatiletka be instituted.

2. That the various trusts interested in machine tool construction work out a plan of production for each year of the second Piatiletka within the limits of types and quantity laid out in our Order 557, previously referred to.

3. That a financial sector be created to budget the cost of machine tools in the second Piatiletka, starting especially with this year's budget so that the plan may be met.

4. That the planning sector of Glavstankoinstrument concentrate its immediate investments in the development of new plants now operating and plants under construction.

5. That special attention be given to hastening the construction of the plant for heavy machines in Sverdlosk, so that production may be started there.

6. The chief of Glavimport is held responsible for the timely construction of new machine tool plants, of which the following are given a preferential standing:

(a) Stankolit—Moscow. Foundry.

(b) Stankoconstruction—Moscow. Experimental.

(c) Drilling machine plant—Karkov.

(d) Samotochka Plant—Moscow. For shapers, slotters and grinders.

(e) Heavy machines plant—Sverdlosk.

(f) Milling machine plant—Gorky.

7. The designing departments be created by Glavstankoinstrument to provide the necessary drawings for the accomplishment of this plan.

8. That all machine design "Nachalniks" (leaders) should begin the design of special machines needed in the above mentioned industries during 1934, and give technical assistance to new plants which are beginning production of machine tools.

9. That the State Employment Bureau give Glavstankoinstrument about 100 graduates from the high technical schools in furtherance of the designing plan.

10. That the personnel department of the various plants involved should provide their personnel with pay and living conditions equal to those prevailing in the automotive industry.

Molotov, in his report to the seventeenth Party Congress stated that the welfare and progress of the country depended upon achieving a technical reequipment of all branches of the national economy, to reach the productive level of foremost capitalist countries.

If this was to be accomplished by imported machinery, it would well-nigh bankrupt the country, the program of the second Piatiletka being so much greater in scope than the first. In the first Piatiletka, 1500 million roubles was spent on foreign machine equipment, but at the end of the first Piatiletka, this foreign equipment accounted for only 35 per cent of the industrial production of the country. How much equipment, then, would the U.S.S.R. have to import to obtain 80 per cent of the output from new factories with the total output doubled as compared with 1932? "Plain arithmetical calculations show that the program of the second Piatiletka would be fantastic if it were based on the importation of equipment."

Therefore, Molotov stated emphatically that, "it is our task to insure the fulfillment of the technical reconstruction of the national economy with the aid of Soviet machine construction." Inclusive of the 21 machine tool plants contemplated, altogether 175 machine building plants of all kinds are scheduled to be built or modernized.

Machine Tools in Japanese Railway Shops

Railway shop machine equipment was the subject of a recent paper by an engineer of the Imperial Government Railway of Japan, which included interesting figures as to the kind of machines used. Out of 2213 machines that we classify as machine tools, the use of different types is of interest. The percentages of the total are given in round numbers. These machines are located in 22 shops of various sizes. Some of them are of good size, as that at Omiya, which was described a few years ago, (*AM*—Vol. 72, page 207) while others are little more than such round-house shops as we have in this country. None of these shops builds new locomotives, which are purchased from private builders, who may, however, be subsidized to some extent.

Engine lathes head the list, as might be expected, but it is somewhat surprising to find grinding machines second in number. They evidently do more grinding than is done in our own railroad shops. Next come vertical drilling machines, followed by shapers, thread cutting machines and millers in the order named. The approximate percentages of each group named is given in the list below:

Kind of Machine	Number	Percent of total
Engine lathes	683	31
Grinders	401	23
Drills, vertical	295	13
Shapers	122	5
Threading	101	4½
Milling	94	4
Turret lathes	67	3
Boring mills	63	3
Slotters	61	2½
Car wheel lathes	57	2½
Drills radial	52	2
Planers	51	2
Driving wheel lathes	29	1½
Boring machines, horizontal	27	1½

The Omiya works previously referred to is the largest, having 438 machine tools to its credit. It is stated that new equipment is bought each year to replace machines that have become obsolete. Among the recent additions are superhigh speed lathes; tire boring machines, axle grinders, boring and milling machines for car brasses and driving boxes. Most of these machines are of Japanese manufacture, but the new boring machine is of German make and uses tungsten-carbide tools. The axle grinding machine shows the trend in the finishing of journals. The Japanese are evidently not tied down by the rolling or burnishing tradition, as is the case in most of our own railway shops.

IDEAS · FROM PRACTICAL MEN

An Efficient Jig

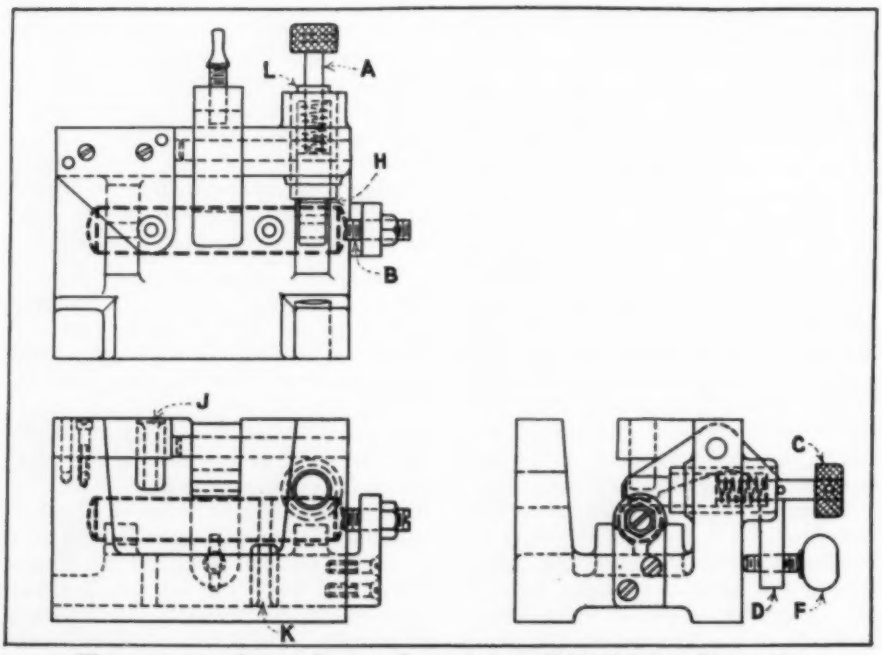
PHIL E. VERAA

The jig illustrated was designed for drilling two holes in the short shaft indicated by heavy dotted lines, locating it from a flat surface previously machined.

In inserting the work, the eccentric plunger *A* is pulled out and the work is laid in the V-block and is pushed against the stop screw *B*. The plunger is then pushed in and is rotated clockwise by the knurled knob *C*, the eccentric part of the plunger locating the work by its flat surface and keeping it pressed against the stop screw. The pivoted clamp *D* is then tightened by thumbscrew *F*, holding the work securely. Hardened bushing *H* is provided to prevent the plunger from getting out of alignment through wear in the hole.

One hole is drilled from the top through bushing *J* and the other hole is drilled from the bottom through bushing *K*, the jig being turned upside down.

In releasing the work, clamp *D* is loosened and the eccentric plunger is rotated counter-clockwise until the stop pin *L* is vertical. The eccentric part of the plunger will then clear the flat surface on the work sufficiently for its removal.



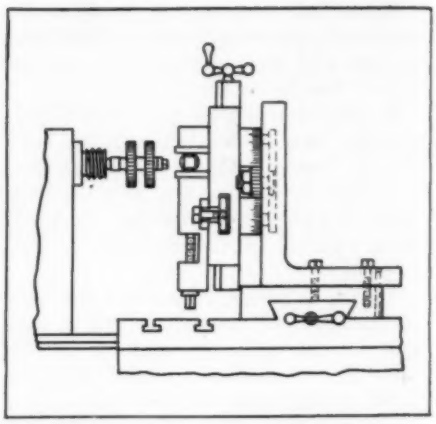
The eccentric plunger locates the work in a V-block by its flat surface and keeps it against a stop screw. A pivoted clamp operated by a thumbscrew holds the work securely

Milling in the Lathe

CHARLES KUGLER

In small shops that have no milling machine, the attachment illustrated can be made for use in the lathe. As shown, it is used for milling squares on the ends of shafts, but other simple jobs can be done as well. Indexing is done by rotating the work 90 deg., using a square for the setting.

The compound rest is attached to an angle plate mounted on the tool block by screws and dowels, and the vise is attached to the compound rest as shown. As the distance through the ears of the vise is greater than the width of the compound rest, a piece of flat bar stock of the proper length is put in the toolpost slot of the compound rest, the ends projecting far enough to receive the bolts put through the ears of the vise.



In shops having no milling machine, various jobs can be milled in the lathe by the use of this simple attachment

Vertical and horizontal feeds are provided by the compound rest and the regular cross feed of the lathe. If a circular slot for the bolts of the compound rest is machined in the vertical face of the angle plate, the compound rest can be set at any desired angle.

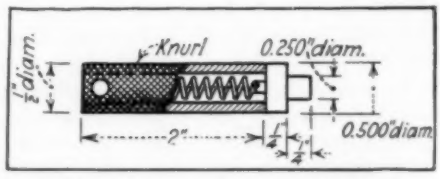
Centralizing Work With the Machine Spindle Discussion

IRA S. WILLIAMS

The methods described by Charles Kugler in an article under the title given above (*AM*—Vol. 78, page 518) seem slow and unsatisfactory. Scribing a reference line on the column of the machine is poor practice. A certain breadth of line is necessary to make it visible. Since the breadth of the line may be anywhere from 0.005 to 0.008 in., it is readily apparent that an error of that amount is possible.

In Mr. Kugler's method, the vertical location only is taken into consideration, nothing being said relative to locating the work horizontally.

Very close results can be obtained by the locating tool illustrated. It consists of a hollow body, a spring, a small pin and a floating button, which



With this tool held in a chuck in the machine spindle, the floating button can be trued by bringing it gradually into contact with the work

may have either one or two diameters, two being shown in the illustration.

In operation, the body of the tool is held in a chuck in the machine spindle. The spindle is run at the fastest possible speed and the periphery of the floating button is gradually brought into contact with either the top or the side of the work, depending upon whether the vertical or the horizontal location is being established. The machine table is then moved vertically or laterally, as the case may be, until the floating button runs true. Any effort to force the button off center will result in its rolling rapidly over the face of the work.

By the use of this tool, any runout errors of the spindle or the chuck are compensated for by the floating feature of the button, and work can be accurately aligned with the spindle within an error of 0.0002 inch.

Aligning Ends of Long Work

J. E. MOORE

The superintendent of an airplane factory brought to our school shop a piece of 1¼-in. tubing reinforced at the ends with flattened inserts of steel. He wanted to find some way to machine the flats on the inserts in line and parallel with each other within a tolerance of 0.002 in., doing the work on a small milling machine. As we were glad to experiment with the job, he sent us several tubes with inserts in place.

We worked out the following method of doing the work: A piece of 6-in. round cold-drawn steel was drilled and reamed through the center axially to fit the outside of the tubing. It was afterward squared by milling, being mounted on a mandrel held between the index centers. After squaring the piece, it was cut in half lengthwise with a ⅛-in. slitting saw, making the two blocks *A* and *B*, Fig. 1. Covers such as the one at *C* were made for the blocks and the necessary holes for clamping screws were drilled in them and the blocks, the holes in the blocks being tapped.

The blocks were then placed on a planer table and a tube was laid in he half-holes and lightly clamped by the covers. The flat on the insert at one end was brought perpendicular to the table, using a square as shown. Then the tube was tightly clamped in the blocks by screwing down the covers.

The whole assembly was taken to a milling machine and block *A* was held in the machine vise. Block *B* and the free end of the tube overhung the machine table and were supported by blocking from the floor. In this position, the insert at the use end was milled with a pair of straddle mills. The tube was then turned end for end and block *B* was held in the vise, the second insert being milled in the same way as the first. When the job was checked, the flats on the inserts were found to be in line and parallel with each other within the required tolerance. This method was used on tubes for several airplanes without a single rejection.

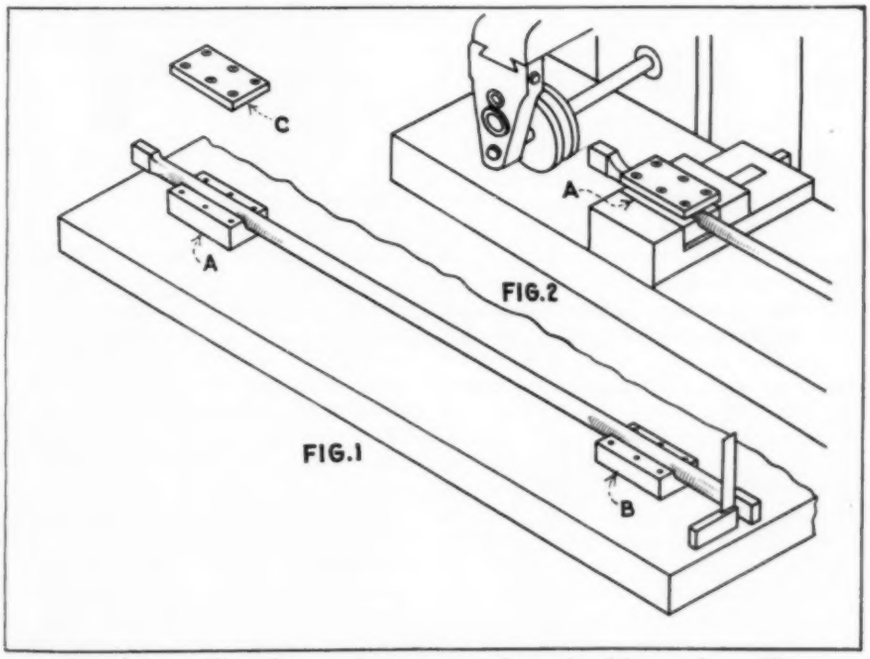


FIG. 1

FIG. 2

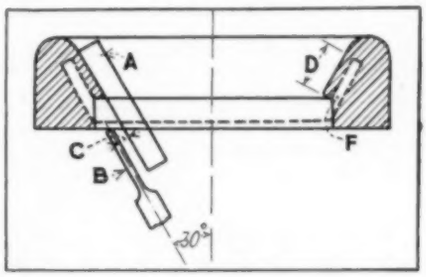
Set-up for milling flats on the inserts in the ends of long tubes. The flats are to be in line and parallel with each other within 0.002 in. tolerance

A Problem in Dimensions Discussion

PAUL C. BRUHL

Referring to the article by L. Kasper under the title given above (*AM*—Vol. 78, page 516), I offer the following solution for locating the angular groove in the ring described, without the necessity of making a special tool.

If a parallel is clamped in the taper bore, as indicated at *A*, a parting tool, as at *B*, can be set to rough out the groove. The compound rest is set to



Dimension *C* can be measured from a parallel clamped in the taper bore of the ring to a parting tool held in the compound rest

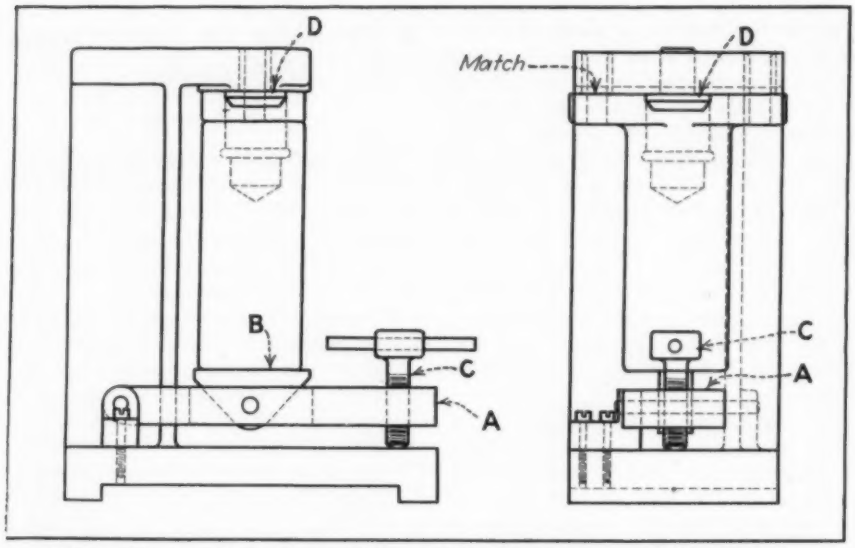
an angle of 30 deg. to the center line of the lathe. By traversing the carriage, the tool can be set to dimension *C* between it and the parallel. The carriage is locked in position and the compound rest is used to feed he tool into the work to depth *D*. The groove is then machined to width *F*, automatically leaving the shoulder of the counterbore in the correct position.

Clamping Work From Below

F. SERVER

In jig design, the clamping arrangements for holding the work often determine the efficiency of the entire drilling operation. In the jig illustrated, two holes are to be drilled in the flange at the upper part of the work indicated in heavy, dotted lines. The work is placed in position while the jig is upright and is clamped from below.

The clamping mechanism consists of the hinged plate *A;* the pivoted pad *B;* and the clamping screw *C*. In operation, the work is slid into the jig, resting on the pivoted pad. The clamping screw is then turned, raising the hinged plate, the pivoted pad and the work, bringing the upper end of the work tightly into contact with the finished, under side of the bushing plate. The pivoted pad equalizes the pressure and the work is centered by the pilot *D* in the hole.



The work is placed in position while the jig is upright, and is clamped against the under side of the bushing plate by the clamp operated by the T-handled screw

If the flange to be drilled is of irregular shape, the under side of the bushing plate can be fitted with a pad of the same contour as that of the flange. Before clamping the work tightly, the operator can rotate it so that the contour of the flange matches that of the pad on the under side of the bushing plate. The clamping screw can then be turned to hold the work securely.

Devices for Starting Axial Holes Centrally

PETER L. BUDWITZ

A machinist having to drill axial holes in some spindles in the lathe made the device illustrated in Fig. 1 to keep the drill central. The device is a piece of tool steel counterbored to fit the ends of the spindles and having a hole to guide the drill and a lever to prevent it from revolving with the work. After the drill has penetrated the work a safe distance, the device is removed and the drill is guided by the partly-drilled hole.

Another type of device for the same purpose is illustrated in Fig. 2. It is a piece of tool steel counterbored larger than the diameter of the work to be drilled. It has a hole for guiding the drill and is provided with two adjusting screws and a thumbscrew for clamping. The hole for guiding the drill is countersunk at an included angle of 60 deg. In use, the device is centered on the end of the work by entering the tailstock center into the countersunk hole. After the adjusting screws have been brought into contact with the work, the device is clamped to the work by the thumbscrew. This device, of course, revolves with the work. When once adjusted it can be repeatedly used on work of the same diameter. In both devices, hardened bushings can be used to suit drills of various sizes.

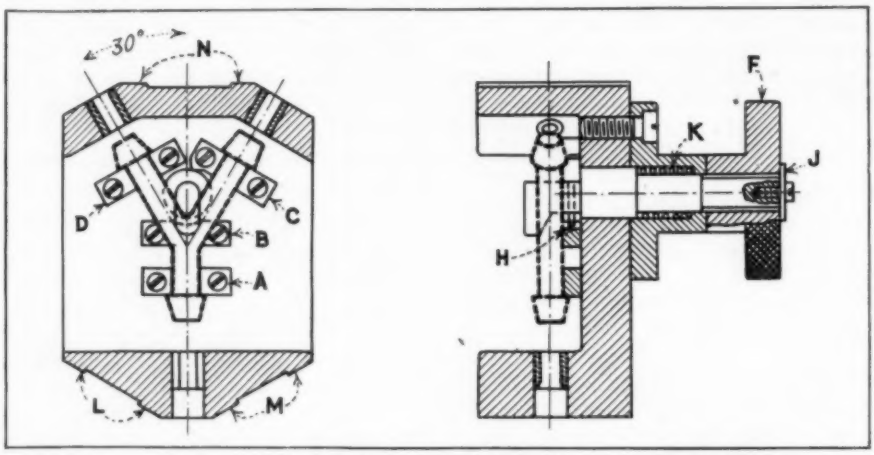
A Roll-Over Jig

J. DECKER

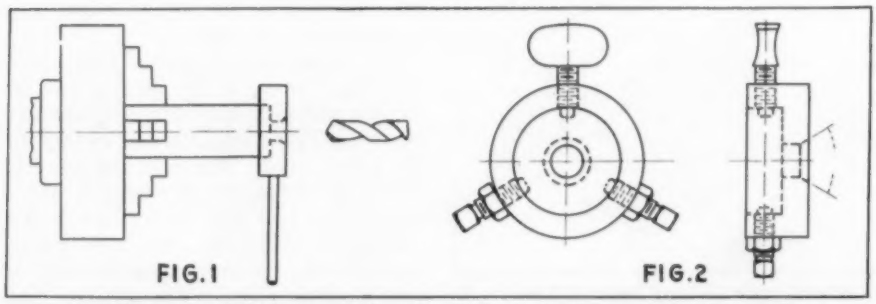
The jig illustrated was designed for drilling the holes in forged-brass Y-connections. The body is steel and has four plates, *A*, *B*, *C*, and *D* for locating and aligning the work. The single clamp has a toe to clamp the work just below the junction of the Y-branches. It is operated by the knurled nut *F*, by which it is also rotated, so that the toe either clamps the work or releases and clears it, depending upon which way the nut is turned.

When nut *F* is turned clockwise, the toe of the clamp is turned downward and is arrested in that position by pin *H* engaging a notch in locating plate *B*. Further turning of the nut clamps the work. Turning nut *F* counter-clockwise releases the work. When the nut contacts with washer *J*, further turning brings the toe of the clamp upward until pin *H* strikes a projection on locating plate *C*, clearing the Y-branches of the work. The work can then be removed.

Spring *K* is provided to push the toe of the clamp away from the work as it is unclamped. The axial movement of nut *F* is about one thread, making the clamping quick and efficient. The jig is of the roll-over type and rests alternately on the feet *L* and *M* when drilling the *Y*-branches and on the two feet *N* when drilling the straight stem.



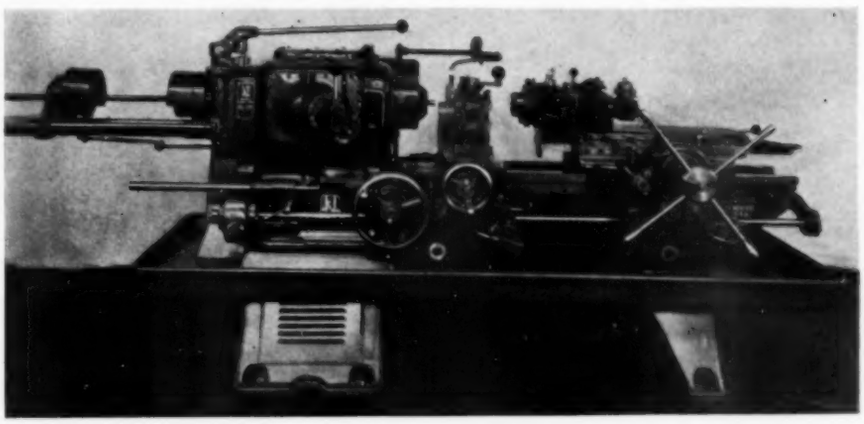
The main stem and the two branches of forged-brass Y-connections are drilled in this roll-over jig, the work being held by the toe of the clamp



In drilling axial holes in shafts, the drill can be kept central by applying either of these devices to the ends of the work

SHOP EQUIPMENT NEWS

J & L Universal Ram-Type Turret Lathe



Jones & Lamson Machine Co., Springfield, Vt., is offering a universal ram-type turret lathe in two sizes, 1½ in. and 2½ in. bar capacity. The fundamental purpose of this machine is to permit the use of carbide cutting tools at highest efficiency and with a margin for future developments, and at the same time to provide the factors of mechanism, convenience and accuracy necessary to perform ordinary turret lathe operations with ordinary tools at the highest efficiency.

The single-lever dial selector controls all speed changes in the headstock. One lever controls the forward and reverse motion of the spindle and a brake stops the spindle automatically at the neutral position. Twelve selective forward and reverse spindle speeds are supplied in two standard ranges, namely: 20 to 1,000 r.p.m. or 40 to 2,000 r.p.m. to cover the requirements of all cutting tools from carbon steel to carbide. Shafts are mounted on anti-friction bearings. The headstock gears are ground, and the complete headstock is lubricated with a splash and filter system. The main spindle is equipped with an 8-in. flange with a taper pilot. Either a flange-type motor or a motor mounted in the cabinet leg with drive through multiple V-belts can be supplied.

The bedways are made of steel, carburized, hardened and precision ground. Hold-down screws enter blind tapped holes in order to provide an uninterrupted bearing surface for the carriage and saddle. The carriage is of the universal bridge type. T-slots in the front and rear of the carriage cross-slide provide for multiple tooling. Standard equipment includes a square turret on the front and a dovetail tool-slide on the rear. Maximum multiple tooling for rear-mount tools may be attained by means of dovetail tool blocks fitted to the tool slide. The carriage apron is equipped with a sliding gear transmission for nine variable longitudinal and cross feeds. The range of feeds for longitudinal travel is from 0.005 to 0.100 in., and the cross feed range is from 0.0025 to 0.050 in. per revolution of the spindle.

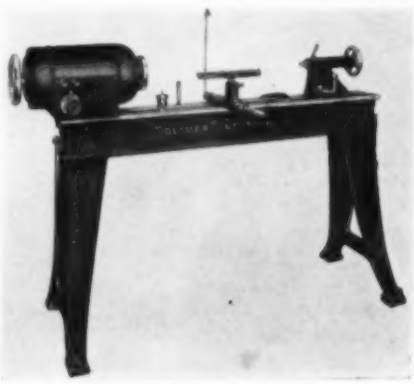
The carriage is equipped with a spool stop for longitudinal feeds and an adjustable stop bar, also a spool stop for the cross feed with adjustable stop dogs which disengage the feed in either direction. The carriage feed is automatically disengaged as the carriage comes in contact with a stop, or it can be manually tripped. The feed knock-off is against a positive stop. For turning or boring tapers a standard taper attachment is bolted to the rear of the carriage. A thread-chasing attachment, installed on the carriage apron, is also standard equipment.

The machine is fitted with a hexagon turret with all faces bored, counterbored and drilled for mounting standard bar and chucking tools. It is indexed with a star wheel. The turret is equipped with an automatic clamp ring. On the return movement of the slide the turret is unclamped, indexed to the next position and on the forward motion automatically clamped. It is equipped with six adjustable stops.

The apron for the turret is similar in construction to the one used for the carriage and is equipped with nine variable feeds all controlled with a single-lever dial selector. The range of feeds is from 0.005 to 0.100 in. per revolution of the spindle. The collet chuck has a master collet fitted with removable jaws for different sizes and shapes of stock. The bar feed mechanism permits the operator to stand at normal operating position, unlock the collet chuck, feed the bar through the spindle, clamp the collet chuck and while the machine is running, ratchet the stock carrier back for another series of feeding operations, all by the use of a single lever.

Oliver No. 51-K Speed Lathe

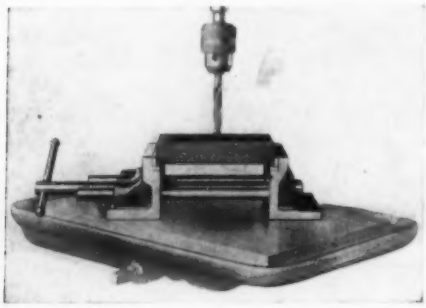
A speed lathe with an adjustable-speed, single-phase motor in the headstock is being built by the Oliver Machinery Company, Grand Rapids, Mich. Intended primarily for pattern shops, this lathe has a range of speed from 600 to 3,600 r.p.m. The motor is of the single-phase, series-compensated type and will operate on any single or poly-



phase circuit of proper voltage and can be furnished for any frequency from 25 to 60 cycles. The entire controlling mechanism is contained in the motor. Speeds are obtained by turning the handwheel.

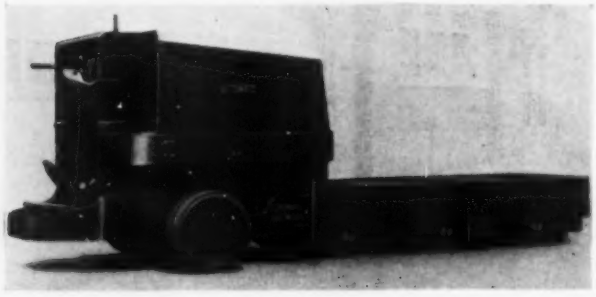
National Drill Press Vise

A drill press vise with built-in parallels is being manufactured by the National Machine Tool Company, Racine, Wis. The vise can be used from three sides. Work always rests parallel and cannot slip. Holes can be drilled through and there is a 2 in. clearance. Cross holes can be drilled easily in round shafting by using of the V-groove below the parallels. Three models are built: No. 1 having a jaw opening of 3 in.; No. 2 a jaw opening of 10 in. and No. 3 a jaw opening of 10 in. Widths of jaws are 2½, 6 and 8 in. respectively, and the depths, ¾, 2 and 3 in.



"Automatic" Electric Truck for Body Dies

Large automobile body dies weighing over 30 tons can be transported to and from the press by the electric truck illustrated. Built by the Automatic Transportation Co., 101 West 87th St., Chicago, Ill., this body die truck has power steering and full magnetic operation of travel, lift and steering motors. The load platform does not exceed 40 in. wide, 96 in. long and 17 in. high, and is thus capable of entering the skids on which the heavy dies are mounted. The vertical lift elevates the skid on which the dies are carried 4½ in. from the floor.



Cincinnati No. 1-12 Plain Automatic Milling Machine

A small milling machine especially designed for milling typewriter parts, business machine parts, and similar work is being offered by the Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio. Spindle speeds are available up to 1,800 r.p.m. in eight steps by means of pick-off gears located in the column. Three series of speeds are available: low, from 40 to 361 r.p.m. furnished as standard; intermediate, furnished on request, and a high series ranging from 246 to 1,800 r.p.m. at extra cost. A spindle reverse is provided. Sixteen table feeds up to 80 in. per min. are available with pick-off gears. Standard series ranges from 2 to 80 in., and special series supplied at extra cost from 1 to 40 in.

The table has a complete automatic working cycle which includes a sensitive control lever for engagement, a power rapid traverse at 400 in. per min., and dog-controlled intermittent feed and rapid traverse in any combination or direction, depending on the type and number of table dogs employed. The position of the control lever determines the direction of the table travel and also whether the table is moving at the feed or rapid traverse rate. A single lever to the right of the vertical adjusting crank starts and stops the table movement without affecting the operating cycle. Power longitudinal travel is 12 in. with rack feed. Working surface of the table is 8½ in. x 25¾ in.

The machine itself is patterned after the Cincinnati knee-type millers in that it has a pyramid-shaped column with self-aligning rectangular dovetail overarm and light-weight arbor support. The completely inclosed motor drive uses multiple V-belts, but is readily accessible. The knee is of sturdy proportion and incorporates a long column and table bearings. There is no saddle and the knee is provided with hand adjustment of 8 in. vertically. A national standard No. 40 taper is used in the spindle. The entire spindle drive rolls on anti-friction bearings. An automatic spindle stop can be supplied at extra cost.

General Electric W-23 Coated Arc-Welding Electrode

For production of high-speed, high-quality welds in the flat position, the General Electric Co., Schenectady, N. Y., has developed the Type W-23 heavily coated arc-welding electrode. The electrode is suitable for either manual or

Showing convenient table height for fast work handling on the Cincinnati No. 1-12 Automatic Milling Machine

automatic are welding and is said to produce equally good results on either a.c. or d.c. Economy in the production of high-quality welds is secured by the ability of Type W-23 to operate at higher speed, in larger diameters (¼, ⅜ and ⅜ in.) and at higher current values than commonly used. The electrode fuses uniformly with the side walls of the joint, saving the time spent in chipping out slag from pockets at the line of fusion.

Fellows Nos. 7LS and 10LS Recess-Type Gear Lapping Machines

The Fellows Gear Shaper Co., Springfield, Vt., is offering a machine adapted to the lapping of both spur and helical gears. For spur gears the use of an internal-gear type lap is recommended and for helical or herringbone gears three external helical gear type laps. On the 7LS machine the three lap spindles are located at 5 in. center distance and on the 10LS machine this center distance is 10 in. Figs. 1 and 2 show the 10LS machine arranged for lapping external helical gears and external spur gears respectively.

The following description applies principally to the operation of the machine when the three laps are employed for lapping helical gears. The spindle carrying the work is positively driven through change gearing, and the three laps are rotated by the action of the work. A friction brake is applied to each of the three lap spindles, and the pressure can be varied. It is evident that each lap is in positive contact with the work, thereby providing equalization of pressure and lapping action. Distribution of the lapping compound is facilitated by imparting a reciprocating movement to the work. The center distance of work and lap spindles is not adjustable. Through the medium of independent adjusting mechanisms, the two upper lap spindles, which are mounted on self-aligning ball bearings, can be set at a slight angle with relation to the work. This feature makes possible the correction of slight errors in the axial relationship of the teeth resulting from heat-treatment.

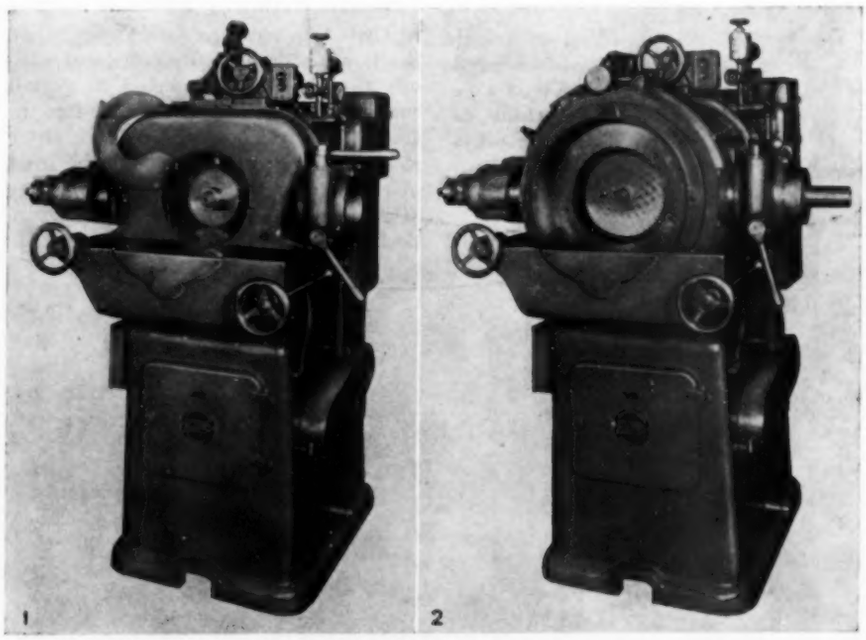
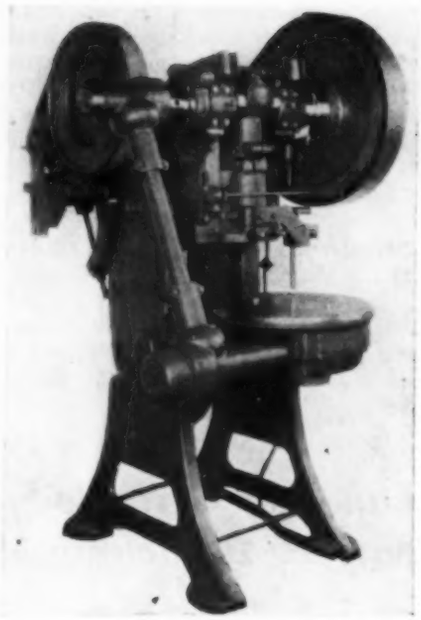


Fig. 1.—Fellows No. 10LS Recess-Type Gear Lapping Machine arranged for lapping external helical gears by using three helical gear-type laps. Fig. 2—Same machine arranged for lapping external spur gears using a detachable internal lap head

Federal Dial Feed for Presses

The Federal Press Co., Elkhart, Ind., has placed on the market a dial feed in which every moving part is completely housed to afford complete safety to the operator. The dial has been designed so that tooling jobs can be interchanged



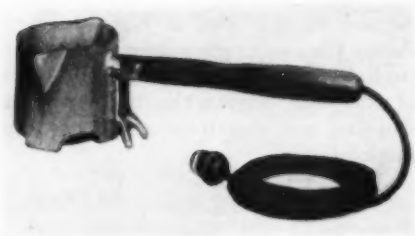
with the ease of changing ordinary die sets. The dial plate is independent of the indexing mechanism and can be removed. Any number of dial plates can be used as they are low in cost.

The dial feed operates at high speed because of its smoothness and positive indexing, the indexing mechanism being completely protected from dirt and chips. The dial is skid proof and yet does not employ brakes, locking pawls or other devices for stopping the dial correctly. It is possible to index the dial in one-fourth revolution of the crankshaft, thus allowing longer rest or loading periods between indexing.

Eisler Electric Saw-Brazing Machine

The Eisler Engineering Co. Inc., 759 South 13th St., Newark, N. J., is marketing an electric saw brazing machine for joining bandsaw blades or flat stock. This machine operates on 110 or 220 volts a.c., and is made in four sizes for brazing widths of stock up to 3.35 in. The parts to be brazed are first pointed and beveled to a knife edge. They are then lapped along these edges and held in position by means of a special clamping arrangement. The current is turned

on to heat both ends of the blade and a piece of spelter simultaneously. When sufficient heat has developed to melt the spelter, the current is turned off. The brazed section is compressed between the jaws of a special tool, after which it is reheated for annealing.



Struthers Dunn Electrically Heated Ladle

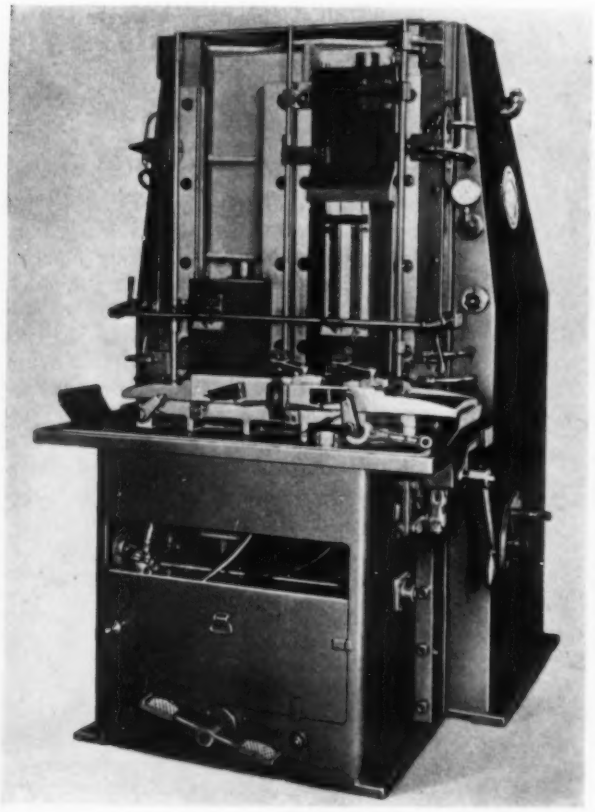
Struthers Dunn, Inc., 139 N. Juniper St., Philadelphia, Pa., has developed a series of "Dunco" electrically heated ladles. Style 612 pouring ladle illustrated has a capacity of 1¼ pints and is used for solder and babbitt. It has a double lip for pouring. Electrical input is 330 watts. Temperatures up to 450 deg. F. are secured. The overall length is 15½ in. The container is of cast aluminum.

Lapointe Variable-Speed Hydraulic Surface Broaching Machines

The Lapointe Machine Tool Co., Hudson, Mass., is now building a line of vertical hydraulic surface broaching machines having variable speeds. This line of machines may be had in a 3-ton size single or double-ram type, a 6-ton capacity, single and double ram type, and 12- and 20-ton capacities in the single-ram type only.

These surface broaching machines are made principally of electric welded steel, except that the main pressure cylinder and the broach slide are made of cast semi-steel. The broach slide is pulled downward on its working stroke so that the piston rod is under tension. A foot pedal and hand lever are provided for the operator. The foot-pedal control is for production use and is of the non-repeat type. Both the up and down strokes are controlled either by the foot pedal or the hand lever, or may be arranged so that when the foot pedal is depressed the ram will make a down stroke and then return to the upper position and stop automatically. The hand lever may be used to get the same cycle as with the foot pedal.

In these machines the electric motor, hydraulic pump and coolant pump are mounted inside the frame which is made of light material and serves only as the housing. On another heavy housing are mounted the main cylinder, broach slide, ways for broach slide and platen. The broach slide is wide to allow for the mounting of different widths and shapes of broaches. It is also thick enough to permit drilling and tapping for mounting broaches. A keyway 1-in. wide extends for the entire length to centralize the broaches with the fixture.

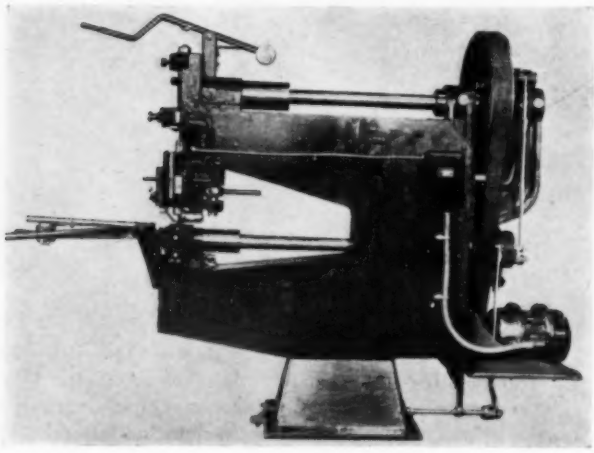


Lapointe Variable-Speed Hydraulic Surface Broaching Machine in the 3-ton, double-ram size. Stroke is 18 in.; platen, 47 by 20 in.

Gray Turret-Head Nibbler for ¾-in. Plate

The Gray Machine Co., Box 596 Philadelphia, Pa., has developed a larger size turret head nibbling machine to cut irregular shapes in sheet or plate stock ¾ in. thick. The throat depth of this machine is 36 in. It can be used either for cutting to a scribed line or reproducing by a master templet. The machine has a turret head for cutting sheets and plates without turning the stock twice in the width of the throat depth and of any length. This machine is also convertible into a roller-die type metal cutter using a square tool. One of the features in connection with this type is that all the backlash in the rollers has been eliminated while the cut is being made. Heretofore, back lash in the feed rollers has required cutting the feed down in heavy stock and has been a continual source of tool breakage.

Another feature of this heavy machine is that the eccentric and main drive shafts are separate. Eccentrics of various throws can be inserted to permit running at the proper speed for the stock being cut. The frame is of all steel welded construction. At the front of the machine is shown a circle-cutting attachment and adjustable arms for supporting the stock.



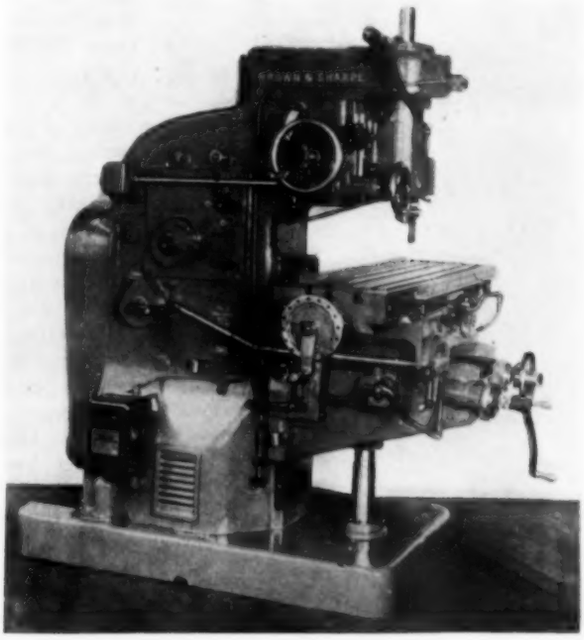
Brown & Sharpe 1-in. Heavy Micrometer Head

Suitable for use with machines and fixtures subjected to unusually severe requirements, a 1 in. heavy micrometer head No. 296 has been announced by the Brown & Sharpe Mfg. Co., Providence, R. I. The micrometer head is used as an integral part of a fixture, or by means of a clamp for making fine measurements and adjustments. Length of the shank is $1\frac{1}{8}$ in., and the diameter is ½ in.

Brown & Sharpe No. 2 High-Speed Vertical-Spindle Milling Machine

The Brown & Sharpe Mfg. Co., Providence, R. I., has added a No. 2 high-speed, vertical-spindle milling machine of essentially the same design and capacity as the regular No. 2 machine, but having a greatly increased range of speeds and feeds, together with other improvements. Spindle speeds are provided in 32 changes from 20 to 1,300 r.p.m. in geometrical progression and in either direction. Changes are made by sliding gears in two series, controlled by means of a backgear lever and by rotating a single lever on the left side of the machine. The speed in use is indicated on a direct-reading dial, one revolution of the lever giving a change in speed. Because of the higher speeds the back gear range has also been increased, including 16 back gear speeds to 150 r.p.m. All gears in the high-speed train are made of alloy steel and have integral keys.

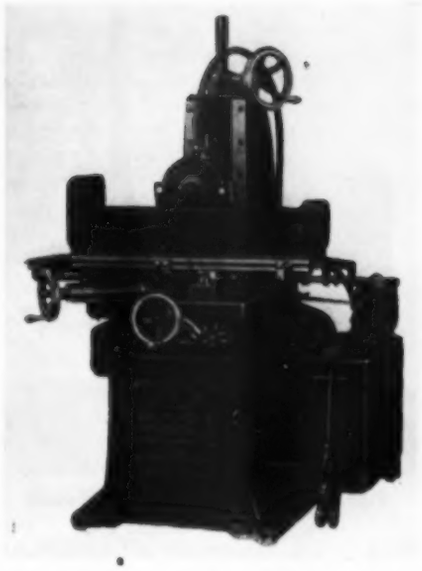
Feeds are also provided in 32 changes in practically geometrical pregression from $\frac{7}{16}$ in. to 62 in. per min. These changes are made by a single rotating lever controlled either from the front or rear operating position. A direct-reading dial indicates the feed engaged, one turn of the lever being required for each rate of feed. The usual feed for the spindle head is provided with automatic release at any point and also with fine hand feed with quick return. The machine can be arranged for belt drive.



Spindle speeds are extended to range from 20 to 1,300 r.p.m., and feeds from 7/16 in. to 62 in. per min., both in 32 steps, on the Brown & Sharpe High-Speed Vertical-Spindle Milling Machine. Direct-reading dials show speed and feed in use

G & L No. 25 Hydraulic-Feed Surface Grinder

The Gallmeyer & Livingston Co., Grand Rapids, Mich. is building a No. 25 surface grinder with a table surface of 6x18 in. The automatic longitudinal and transverse movements are sufficient to enable the operator to cover the entire working surface of the table with a ½ in. wide wheel. The hydraulic mechanism is mounted inside the base and is driven by a 1-hp., 1,200-r.p.m. motor. Maximum longitudinal table speed is 50 ft. per min., controlled by a lever at the front of the saddle. Either an automatic cross feed or a hand cross feed can be had.



A choice of two types of motor drives is offered. For 50 or 60-cycle current the motor is mounted directly on the grinding wheel spindle and a 7-in. wheel is standard equipment. The second type of spindle drive consists of the motor mounted on an adjustable bracket and driving the spindle through Tex-ropes. In this case an 8-in. wheel is furnished. A portable self-contained motor-driven coolant system can be furnished. When the tank is to be cleaned the cover is lifted off complete with the ¼ hp. motor and pump mechanism. A self-contained motor-driven dust arrester system can also be furnished.

Dayton Rogers "Angle Plate and Holocator"

For drilling, locating, measuring and laying out as well as checking, the Dayton Rogers Manufacturing Co., 1845 E. Franklin St., Minneapolis, Minn., is now

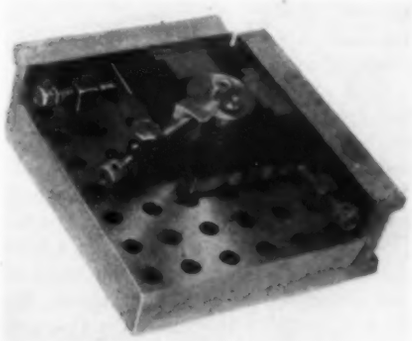


Fig. 1—By this rectangular system of hole location, dies and drill jigs can be produced quickly and accurately

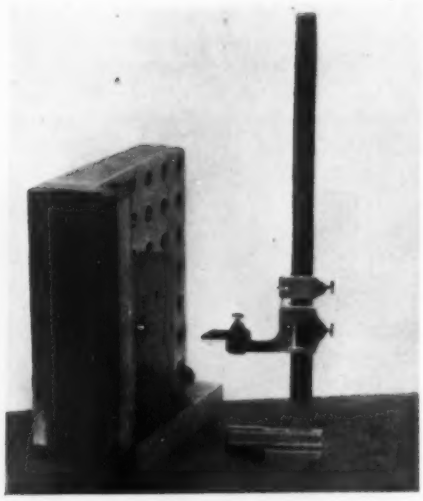


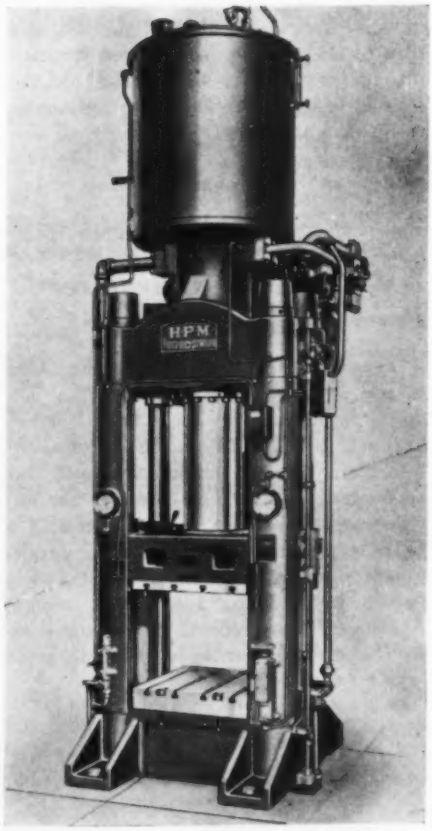
Fig. 2—Cross-checking the work with a vernier height gage

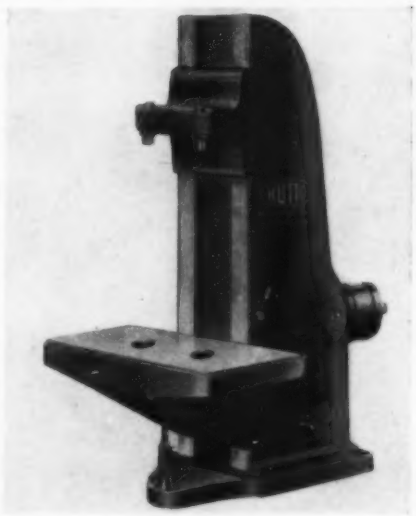
supplying an "Angle Plate and Holocator". The combination is not necessarily limited to small tool and die work, but can be used in producing accurate parts in small lots where special drill jigs would be required.

Laying out of die blocks and drill jigs is done as shown in Fig. 1. The feature of this device is the employment of a precision ground bushing disk, of which three of different size are furnished. In conjunction with the sets of gaging blocks, the bushing disk is used to make rectangular measurements quickly and accurately. A standard drill bushing is located in the disk and can be changed for another size. After the work is laid out it is cross-checked with the vernier height gage, Fig. 2. Capacity of the device is 5 by 6½ in. Either metric or English system measurements can be made with the same sets of gaging blocks.

Grob Model B-3 Filing Machine

Grob Bros., South 97th St., and West National Ave., West Allis, Wis., have announced a bench-type Model B-3 filing machine which cuts continuously by means of an endless file-chain. The machine is offered for filing of dies, punches, templets and miscellaneous parts. The machine has a three-speed V-belt drive and a positive drive to the file chain. An improved feature is the arrangement for quick release of the tension on the file-chain. A single movement of a lever on the upper left side of the machine and connected with a cam moves the idler sheave downward. With this provision the time required to set up for internal filing and to change file-chains is reduced to half a minute. Material up to 4 in. thick can be filed and the file chain can be inserted into openings as small as ⅜ in. in diameter. The tiltable table measures 15x17 in., and is 14 in. above the bench. The total height of the machine is 29 in. Weight, 175 lb.





"H-P-M" Long-stroke Drawing Press

A long-stroke press of the "Hydro-Power Fastraverse" class is now being built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This press is equipped with a synchronized-pressure die cushion and it is suitable for such deep-drawing operations as streamlined automobile head lamps. The hydraulic die cushion fits the press for performing deeper draws in single operations. This cushion is actuated by a series of hydraulic cylinders that are hydraulically connected with the same source of pressure that operates the press itself. Thus, the action of the die cushion is synchronized automatically with press movements and pressure, the blank-holding pressure being automatically proportioned to the drawing pressure. The press is self-contained having a direct-motor drive through a hydro-power unit mounted on the press head, and is fitted with a complete system of controls for both press and die cushion.

Hutto V-300 Series Honing Machine

The Hutto Engineering Co. Inc., 515 Lycaste Ave., Detroit, Mich., has developed a Model V-300 series honing machine which provides a balance between the rotary and reciprocating motions in order to hone consistently straight and to close limits. The features of this machine are: harmonic reciprocating motion and absence of shock at the ends of the stroke and upon reversal of reciprocation; positively controlled length of reciprocating stroke; synchronization of the rotary motion with the reciprocating motion; impossibility of stalling the reciprocating motion when hone encounters a constriction in the bore or becomes otherwise overloaded, because the rotary and reciprocating motions are affected simultaneously and proportionately and the balance established remain unaffected; coincidental mechanical lift-out control of hone; all-geared driving mechanism.

Other features are as follows: automatic positioning of stroke; automatic cycle timing mechanism if desired; clutch-controlled rotary and reciprocating motions. This machine can be made for single-spindle or multiple-spindle operation. For single-spindle duty the

machine can be supplied with fixed rotary and reciprocating speeds. Where the machine is to be used for utility purposes, two, four, six or eight speed changes for either or both motions can be supplied.

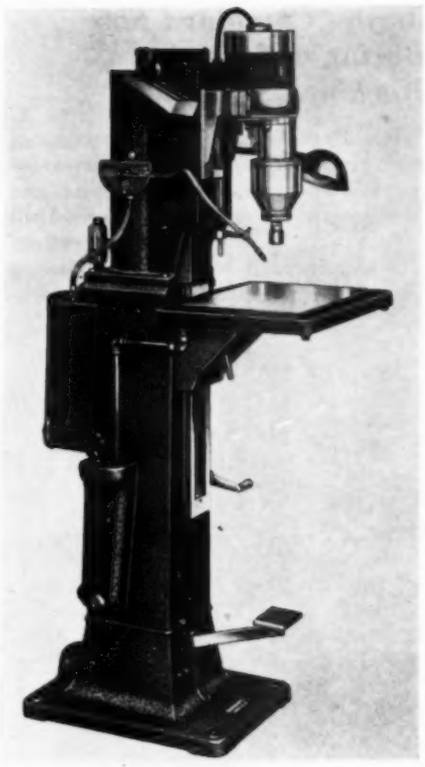
Haskins No. 2 High-Speed Tapping Machine

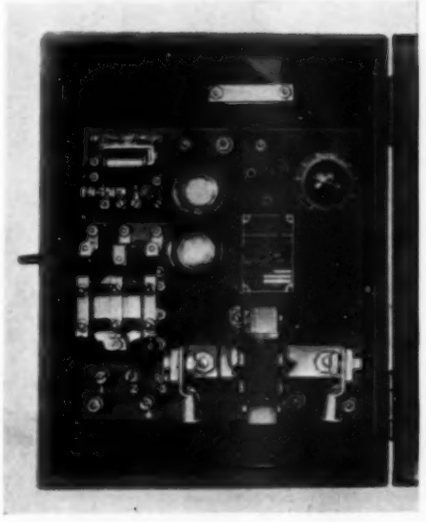
The R. G. Haskins Co., 4636 West Fulton St., Chicago, Ill., has developed a second high speed tapping equipment known as the No. 2. The developments and improvements shown in the No. 2 machine are now incorporated also in No. 1 machine (*AM*—Vol. 75, page 938) in so far as they could be used. The range of the No. 2 tapper overlaps that of No. 1, being No. 10 taps up to and including $\frac{5}{16}$ in. in steel, $\frac{3}{8}$ in. in cast iron and $\frac{7}{16}$ in. in brass and other non-ferrous metals. A ½-hp. motor furnishes power. Two change gears are furnished, giving speeds of 1,100 and 1,750 r.p.m. Reverse speed is double that of the tapping speed. Two vertical shafts, on which the tapping unit is mounted, slide in long bearings, line reamed and lapped to permit free action of the tap head assembly. Adjustable stops are located in the middle of the frame to limit the vertical travel of the tap unit. The ground and balanced tap spindle, complete with the double cone clutch, collet and cap, weighs only 18 oz. Because of the resulting lack of inertia effect, blind holes can be tapped without fear of breaking taps, even though the tap hits bottom. There is no float in the tap spindle. Reverse of the tap is automatically obtained when the pressure on the foot pedal is released.

Zeiss-Ikon Stroboscope

A stroboscope of Zeiss-Ikon design is being introduced in the United States by the George Scherr Co., 128 Lafayette St., New York, N. Y. In this instrument the part in motion is observed through a rotating slit disk, whose speed can be regulated and timed to coincide with that of the moving object. In this condition the stroboscopic action is achieved and the object appears to be stationary, thus permitting its examination. By a slight reduction of the speed of the slit disk, the phase under observation can be moved so as to cover the entire range of the period.

The device may also be used as a tachometer, being equipped with a built-in speed indicator. The indicator permits measurement of any speed up to 140,000 r.p.m. by optical means without being in contact with the rotating part itself.





The Zeiss-Ikon stroboscope may be equipped with a pair of prism binoculars to obtain a closer view of the object, and it may be also used on a wide range of speeds by exchanging slit disks of which seven are furnished as standard equipment, containing from 1 up to 24 slits respectively. The outfit is readily portable.

"EC&M" Improved Automatic Weld Timer

For use with resistance welding machines, The Electric Controller Manufacturing Co., 2702 E. 79th St., Cleveland, Ohio, have developed the Folio 2 automatic timer. Faster operation makes it possible to produce more welds per minute for a given material, and also to increase the number of different kinds and variety of thicknesses of metals which can be welded under its control. In addition to the adjusting dial for varying the time supplied, the No. 2 timer also is equipped with a means to provide a triple current range for a timer of a given capacity. The change from one range to another is obtained by inserting a plug into one of three receptacles located on the front of the panel.

Cleveland High-Speed Punch Presses

The Cleveland Punch & Shear Works Co., Cleveland, Ohio, has added a line of high-speed, deep-throat punch presses that have extra-long adjustment to the slide instead of the conventional 1 in. adjustment. The press illustrated has a 24 in. depth of throat and is of the fly-

wheel type with direct-connected motor drive. This style of press can be furnished in the geared type and with depth of throat to suit requirements. If desired, two presses of similar capacity with equal or unequal throat depth can be combined, making one double-end machine operated by a single drive.

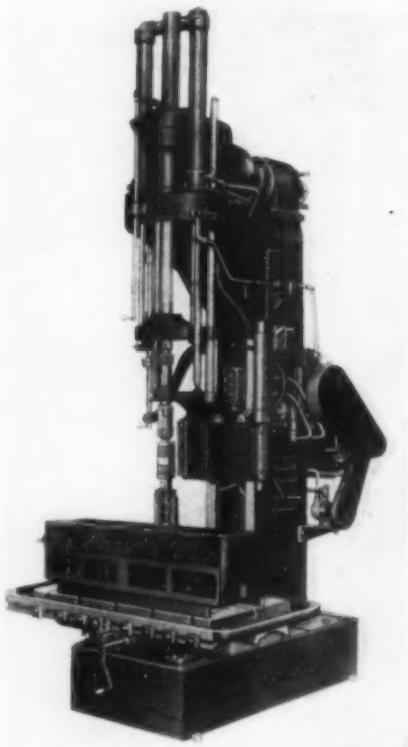
Strobel Electric-Arc Saw

A metal-cutting saw employing an arc to bring the metal to a plastic or molten condition after which pressure created by the saw forces the molten metal from the scarf, is being manufactured by the Rich Manufacturing Co., 3851 Santa Fe Ave., Los Angeles, Calif. The saw blade is of circular form, is of comparatively soft steel, and carries a multitude of small straight teeth on its circumference. In operation it is rotated at high speed and fed into the work. The arc which is formed between the teeth of the saw and the material to be cut is concentrated on the material directly in front of the teeth. As the speed of travel through the material is high, the arc is concentrated at any one point for a short period of time, and therefore only shallow overheating occurs at the sides of the scarf. Usually overheating does not extend more than one millimeter under the surface. The width of the cut is slightly greater than the width of the saw. In the case of a ¼ in. saw, the cut is approximately $\frac{5}{32}$ in. Cuts have been made on spring steels, manganese steels, hard facing alloys, tungsten and tantallum carbides without injury to the blade. Tempered steels can be cut, and the hardness does not affect the speed of operation.

An arc passing from the saw blade to the work rapidly renders the metal plastic or molten, and the fast-running saw blade carries the molten metal out of the cut. Hardened steels are not affected because the overheating extends only one millimeter below the surface

Barnes Combined Fine Boring and Honing Machines

For large service shops specializing upon repowering of motor blocks—automobile, truck, tractor, Caterpillar and diesel engine cylinders—the Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill., has designed combined fine boring and honing machines in two sizes. Size No. 306-C has a 30 in. swing and permits boring and honing 6½ in. in diameter by about 12 to 14 in. deep. The No. 366-C machine has a 36 in. swing, but otherwise is the same as No. 306-C.



Barnes No. 366-C Combination Machine set-up for honing a cylinder block after reboring

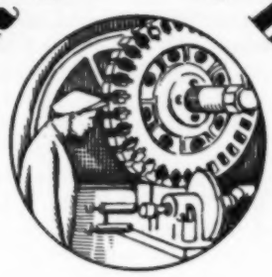
The twin hydraulic cylinders paralleling the spindle reduce the total height of the machine. At the same chucking honing may be done immediately after reboring or fine boring by swinging out of the way the hinged front section of bracket carrying the boring bar, and then mounting the hone. The change from one hydraulic circuit to the other is made possible by a convenient lever. One hydraulic pump circuit affords fine hydraulic feed for fine or reboring operations, while the other pump circuit reciprocates the honing spindle.

American "Tension-Control" Motor Base

The American Pulley Co., 4214 Wissahickon Ave., Philadelphia, Pa., is producing a motor base with belt tension control that changes automatically with every change in motor load.

In operation of a motor the frame is constantly trying to rotate in a direction opposite to that of the pulley and with a force at a given load equal to that being exerted by the pulley through the belt. This force is known as reaction torque and it varies with every fluctuation in the load. In the American "tension-control" motor base the reaction torque has been utilized. The motor is not attached to a fixed foundation, but it is suspended in a cradle and is free to rotate through a limited range. The pivot axis of the cradle is placed close to the motor axis in order to obtain the maximum reaction effect, yet far enough removed so that as the motor swings about the pivot axis, it increases the center distance enough to compensate for belt stretch and to vary the tension with each change in the load. This automatic control of belt tension is in proportion to the load, and low belt tension at no load automatically increases to whatever tension is required up to and including peak loads. The tension control motor base is offered for floor, wall or ceiling mounting.

THE ROUND TABLE



The Better Foreman

"Hello, Ed," said Al, as his friend came into the office. "Put your massive brain to work on a simple problem and tell me which man to put in Bob Peters' place as foreman."

"I'd say Bill Watson. But why is Peters leaving?"

"Got a better job than we can offer him. I don't blame him at all. But why Bill Watson rather than Jimmy Brown?"

"Watson's a better workman—you've told me so yourself. A foreman ought to be able to do as good a job as any of his men, if not better. Men don't respect a foreman who can't tackle any job in the shop and do it as well as any man there."

"I don't agree with you, Ed. We want a foreman, not another mechanic."

"But a foreman ought to be able to show a new man how a job should be done."

"Desirable perhaps, but I can't see that it's necessary. Showing someone else how to do a job is training, not foremanship. In a small shop it's an asset, I'll admit, but in a big shop that is the job for an instructor. Just what do you think a foreman's job is, Ed?"

"Keeping track of work, showing men how to do a job right, seeing that it is right, maintaining discipline in the shop and so on."

"Some sizable order, Ed. According to my way of thinking his primary job is to keep the work moving and get it out on time, assuming of course it's O.K. when it comes through."

"But how can he know it's right if he can't do it himself, Al?"

"According to that, Ed, the general manager of a big plant ought to be able to beat any of his men in any job. Of course he can't do that. Their job is to manage men, not to do the men's work. I figure the foreman's main job is also managing men."

"Thought you didn't like the old driver type of foreman, Al."

"I don't. But who said anything about driving? I said 'managing.' The best managers lead their men and don't try to drive them. You know some of the best workmen make the poorest foremen. Williams told me once that the best shop boss he ever knew wasn't a mechanic at all, and didn't pretend to be."

"The men could put it all over a man of that kind, Al."

"Not more than once, if he's a real man as this one was. He played the game with his men. He gave them full credit for all they did and didn't claim a thing for himself. Every man Jack was working for him, according to Williams."

"So you're going to try Jimmy Brown instead of Bill Watson. I think it's a mistake, Al."

"All the same I'll try it, Ed."

Should a foreman be an expert workman, as Ed thinks? Or can a man who isn't so good at the job make a better leader?

Discussion

By the Week

When everything is considered, a small shop such as Al's can be economically operated on the basis of weekly pay, and most mechanics that I know would rather work by the week. Time clocks are not at all necessary in a small shop.

Considerable clerical work can be saved under a weekly pay system. Also, it would eliminate time and piecework figuring by the men during working hours. Like most good things, the system must have the proper set-up and start, especially when adopted by a concern that has been operating under some other method of payment, and I would suggest the following procedure:

Pick out three or four of the more reliable and conscientious men, explain the proposition to them and thoroughly sell them on it. Have these men work under the new system for a given period and have them sell it to the others and hold it up as something to be worked for, letting them understand that it is an honor to be placed on a weekly pay basis. —C. F. STAPLES.

Payment on a weekly basis seems to be worth a trial in the small shop where the owner is in daily contact with his men and can size up the capacity and the willingness of each individual. But I am doubtful if the larger concern could be run on the same basis. With the larger personnel, that important essential—the personal touch—is lacking in employer-employee relationship.

Paying employees for the one-day holidays that are scattered throughout the business calendar, and possibly for a week's vacation for those having a certain length of service, would inject harmony in both large and small plants. The employee who turns out a conscientious day's work is as much en-

titled to a vacation with pay as is the foreman. True, the foreman shoulders more responsibility, yet both men have the desire to pull their weight for the concern that employs them, and this quality is the source of all dividends and is well worthy of consideration.

—Robert S. Alexander.

Hourly Pay vs. Piece Work

"How can the output be increased by increasing the cost?" is the question that should decide what plan of wage payment is the better. Paying by the piece would be ideal if some of its disadvantages could be eliminated. The main disadvantages are difficulty in setting piece rates that will be permanent; the necessity of cutting piece-rates occasionally; and the added cost of time-keeping and clerical work.

Friction between management and workers often results when a bonus system is employed, mainly because it is difficult to check and give credit for individual efficiency.

A conditional hourly-rate system where the main thought is to pay for the amount of work done without having the disadvantages of either the piece rate or the bonus systems would be the solution. To develop such a system, a careful study should be made as to the output possible from every machine in the plant. When a man starts work on a machine he should be told of the required output and what his pay will be so long as he consistently produces his quota. Such a system has many of the advantages of the piece-rate system and none of its disadvantages. While it is better suited to the large plant, it should be possible to use it on several operations in Al's plant. —Nils H. Lou.

What Share?

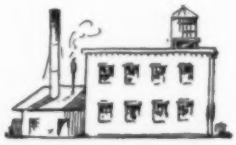
Only a Solomon could answer Al's question at all satisfactorily. Ed needn't feel badly about it at all.

First I think we must agree that the poorest paid man or woman in the place should receive enough to live decently. No shop which cannot normally pay this has a right to exist. It is no asset to any town as the town must supplement the inadequate wage.

In one shop I knew where the owner tried a profit-sharing plan, he worked it in this way. He considered that his capital investment should earn 6 per cent. He allowed himself as manager, a salary equal to what he would pay a man for the same job. He paid the going rate to his men. After these and other expenses were deducted from his income, and he set aside a reserve, he divided the profits pro rata, according to the earnings of his men and his own salary. He considered the reserve as individual profits with the intention of giving any man his share whenever he severed his connection with the company, for any reason. I haven't seen him since 1930 so I don't know how the depression affected the plan. But I do know his close relation with men and I'm betting they all took cuts together, he taking the biggest as has been done by others I know of. I doubt if he has laid off a man permanently or had any labor troubles for most labor troubles can be traced to lack of understanding and sympathy between management and men.

Assuming that men are paid according to their value, a pro rata sharing of profits between management and men seems equitable. If capital is to get more than its standard return, the yearly earnings of both management and men might be considered as their investment. It might even be fairer to count their investment as the total earnings during their employment.

—Herbert Crawford.



The Little Fellow's Chance

I talked to a congressman recently and some of the things he told me were rather surprising. He said, "The big fellow has gotten all the breaks in NRA because he has had representatives on the spot, besides making certain that his congressman knows his opinions of and reactions to various items and codes. But the little fellow doesn't even take the trouble to write his congressman, his only representative, of what he thinks. So what happens? Naturally the congressman goes to Washington with but one set of ideas—and those the ideas of the big fellow. It is not the fault of the congressman; it is the fault of the little fellow who doesn't take advantage of the oportunities he has. This doesn't refer only to NRA and the codes, but to all the laws and by-laws, discussions and arguments regarding labor as well.

"The little fellow has much to say, but he never says it. The big fellow always manages to get in his few words. He isn't given more attention than is the little fellow, but it is hard to convince the little fellow of it. Congressmen are anxious to please the greater number, and the greater number are the little fellows. If every little fellow would 'plague' his congressman and inform him of his opinions, there would be a great many more changes—and not so many of them in favor of the big fellow." —Will Herman,

Superintendent, Tanenbaum & Son Oil Company.

Works Councils and Unions

Al is right in opposing Williams' works-council plan, at least if that body is to discuss matters of economy. If the council is to act as a welfare board, the proposition might be considered.

It is much better for any company to have its men belong to some large union, such as the A. F. of L, because if any local group of workers is to decide on such questions as strikes, it is likely to act too quickly, whereas if all questions are put before a higher authority before any action is permitted, that authority will turn down most of the actions asked for. In any association, the higher officials know better than the members what can and what can't be done.

As to the majority deciding the choice of what union should be joined, it would be unfair to force any type of union on the minority. Let them join any union they choose, and let those who want to stay outside have the right to refuse membership in any union. Majority actions of the workers should come as a result of self discipline.

While friendly discussions on questions of social relations might do some good, the responsibility for such relations can never be removed from the employer. —A. E. Fristedt,

Stockholm, Sweden.

Discounts

Ed says he'd charge interest to customers who did not pay their bills promptly. That is exactly what the giver of discounts does, though in a roundabout way. The interest-charging method is based upon folks paying their bills promptly, and interest is charged if they don't. The discount-giving method is based upon folks not paying their bills promptly, so interest is added beforehand and the result is glorified by calling it the list price. However, if the bills are paid promptly, the amount added for interest is deducted and is called discount.

In any event, discount-giving is a two-edged device. One edge automatically recompenses the seller against the slow-pay artist without seeming to do so. The other edge operates to attract customers who habitually pay cash. While not primarily conceived as such, discounts may easily become price-cutting instruments, and there are those who chisel by the discount route.

—John E. Hyler.